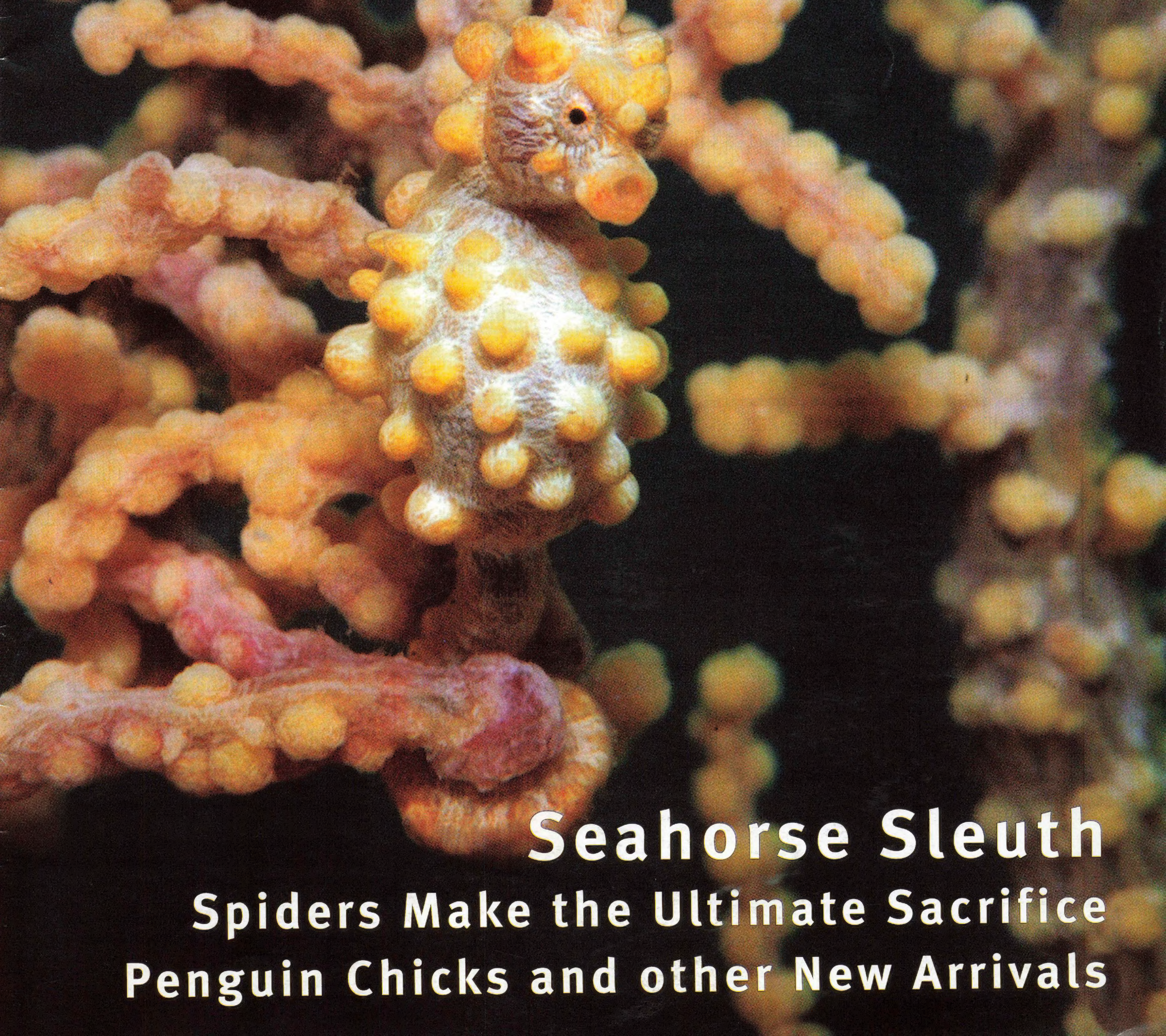
CALIFORNIA
ACADEMY OF SCIENCES



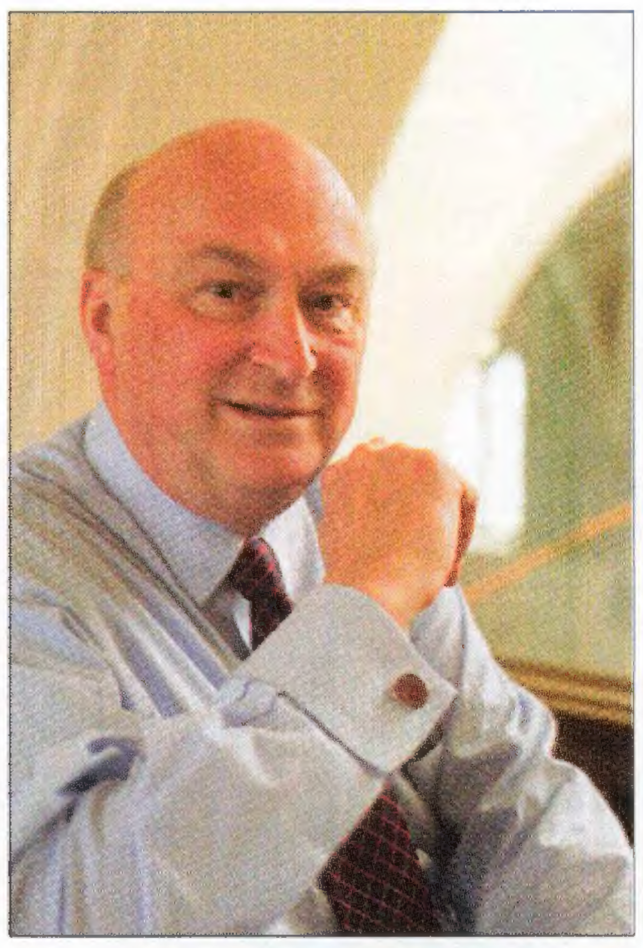
MEMBER PUBLICATION SUMMER 2007

Seahorse Sleuth

Spiders Make the Ultimate Sacrifice

Penguin Chicks and other New Arrivals

MESSAGE TO MEMBERS



The Academy on Howard Street has welcomed a number of new faces in recent months. Three new chicks have hatched in the penguin exhibit, and dozens of new coral reef fish are now swimming in tanks on the first floor. Although their antics and brilliant colors will certainly steal the show, I'm a new face too and am delighted to be here.

I had the honor of taking the helm at the California Academy of Sciences on February 26, 2007. After leading Pennsylvania's Lehigh University for the past eight years, I traded freshmen for penguins and plunged into a new adventure here in the spectacular City by the Bay. Now that I've watched the Academy's black and white ambassadors for a few weeks, I've come to the conclusion that these charismatic birds—with their monogamous partnerships and shared parenting practices—may actually be better behaved than my former charges, at least much of the time. And they certainly are better dressed!

Over the past several months, I have learned a great deal about what it means to serve as the Executive Director of this marvelous institution. I've learned, for instance, that the arrival of summer in the City of Fog means that it's time to pull out my winter sweaters. I have also received a crash course in museum design and construction, and while it was clear from the beginning that the new Academy building in Golden Gate Park would be spectacular, I'm even more enthusiastic about it now than when I arrived, if that's possible. Topped with a living roof and insulated with recycled blue jeans, this innovative building will set a new standard for sustainable architecture. The largest public green building in the world, it is on track to receive the highest possible rating from the U.S. Green Building Council, LEED Platinum.

A chemist by training, I know a bit about platinum. It's the element that symbolizes the highest standard of excellence, and that's what we plan to deliver in our programs of research and education. Most importantly, our guest experience will be platinum, from our exhibits to the new café, museum store, public lectures and displays of art.

Our pursuit of platinum has already paid off. On April 23, after a comprehensive search for the Best Candidate in the Universe, we found Ryan Wyatt and hired him to be the new Director of Morrison Planetarium and Science Visualization. Ryan comes to us from the Hayden Planetarium at the American Museum of Natural History, where he used the latest technologies to produce innovative programs about cosmic collisions, the search for extraterrestrial life, and other out-of-this-world topics. With Ryan's passion and expertise, the future will surely be bright in Morrison's new projection dome.

I look forward to meeting you when you visit. Until then, Go Platinum Academy and Go Penguins too!

- Greg Farrington, Executive Director

MEMBER PUBLICATON

Summer 2007, Issue No. 5

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On the Cover

Graham Short photographed this pygmy seahorse (*Hippocampus bargibanti*) in a colony of soft coral (*Muricella plectana*). Seahorses can change color and grow skin filaments to match their surroundings.

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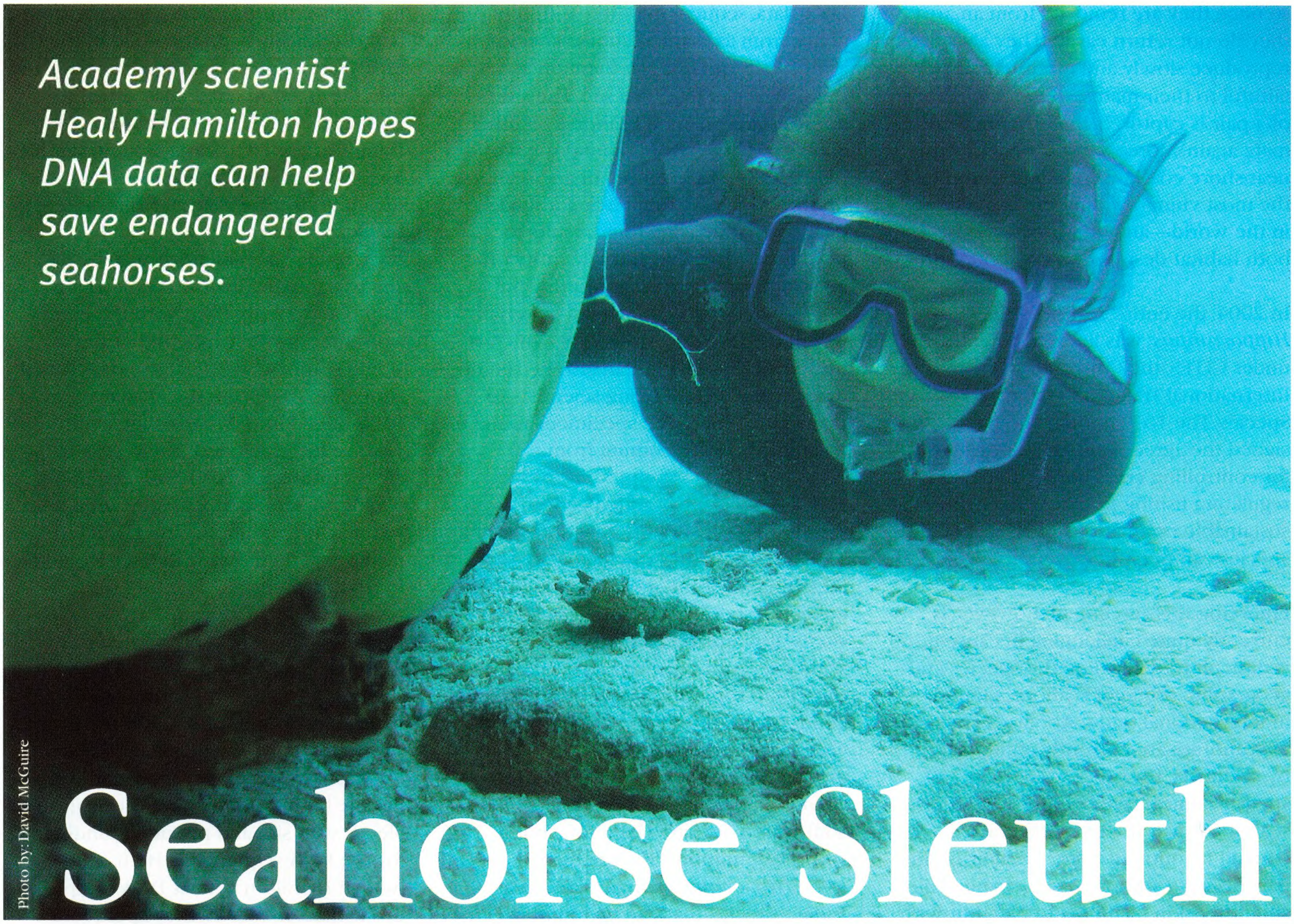


Academy scientist Healy Hamilton hopes DNA data can help save endangered seahorses.

Photo by: David McGuire

Seahorse Sleuth

The frequent focus of both ancient legends and recent legislation, seahorses are among the most intriguing and highly sought-after animals in the ocean. With their strangely equine heads, spiraling tails, and bony body armor, it's easy to see why early naturalists didn't recognize these captivating creatures as fish. Even today, much remains unknown about seahorse taxonomy and biology, and the traits that have been studied only add to their mystique and allure.

Their reproductive strategy, for instance, is both endearing and astonishing. Many species bond in faithful, monogamous pairs, engaging in elaborate courtship dances by intertwining their tails and swimming together in slow circles. After a final dance that can last for up to eight hours, the female deposits her eggs in a pouch on the male's stomach. In a reversal of the typical gender roles, the male then incubates the eggs for up to 25 days, his pregnant belly becoming increasingly distended. Finally, he gives birth to as many as 2,000 tiny seahorses. The appreciative female performs daily dances to exhibit her loyalty.

Given their unusual appearance and extraordinary biology, it is not surprising that seahorses have been credited with magical powers and medicinal properties. In many Asian countries, they have been harvested for use in traditional medicines for thousands of years. Today, more than 75 countries participate in the seahorse trade, and an estimated 24.5 million animals are sold each year for use in Chinese medicine. Dried seahorses are also sold as curios on key chains and other trinkets, and live animals are captured for sale in the aquarium trade.

Thanks to captive breeding programs at a number of aquariums around the world, the pressure to collect seahorses for the aquarium trade has greatly diminished. Steinhart Aquarium, which was one of the first institutions in the world to successfully breed captive seahorses, has raised hundreds of healthy seahorses over the past decade. However, as the Asian economy has boomed over the past 20 years, the demand for seahorse medicinal products has rapidly increased, and seahorse harvesting operations have grown to meet the demand.

Most seahorses on the market are caught accidentally by shrimp trawlers who later handpick them from their nets and sell them for additional income on the international market. A large boat, however, is not a necessary tool for harvesting seahorses. Divers armed with simple nets also frequent the best seahorse habitats, scooping up the slow-moving animals with ease.

Because of their unique life history, seahorses are particularly vulnerable to over-fishing. They are sparsely distributed and travel only short distances as adults, so once they are removed from an area, they do not return easily. They also reproduce slowly and often remain faithful to their mates, so if one member of a pair is captured, the other may never mate again. Moreover, seahorses live in near-shore coastal ecosystems—some of the most vulnerable marine ecosystems in the world—and are threatened by both habitat destruction and pollution.

In 2004, the entire seahorse genus, *Hippocampus*, was listed as threatened under CITES, the Convention in International Trade in Endangered Species. The 167 nations who have signed the agreement are responsible for controlling cross-border trade and regulating fishing practices to ensure that sustainable populations of all seahorse species can persist.

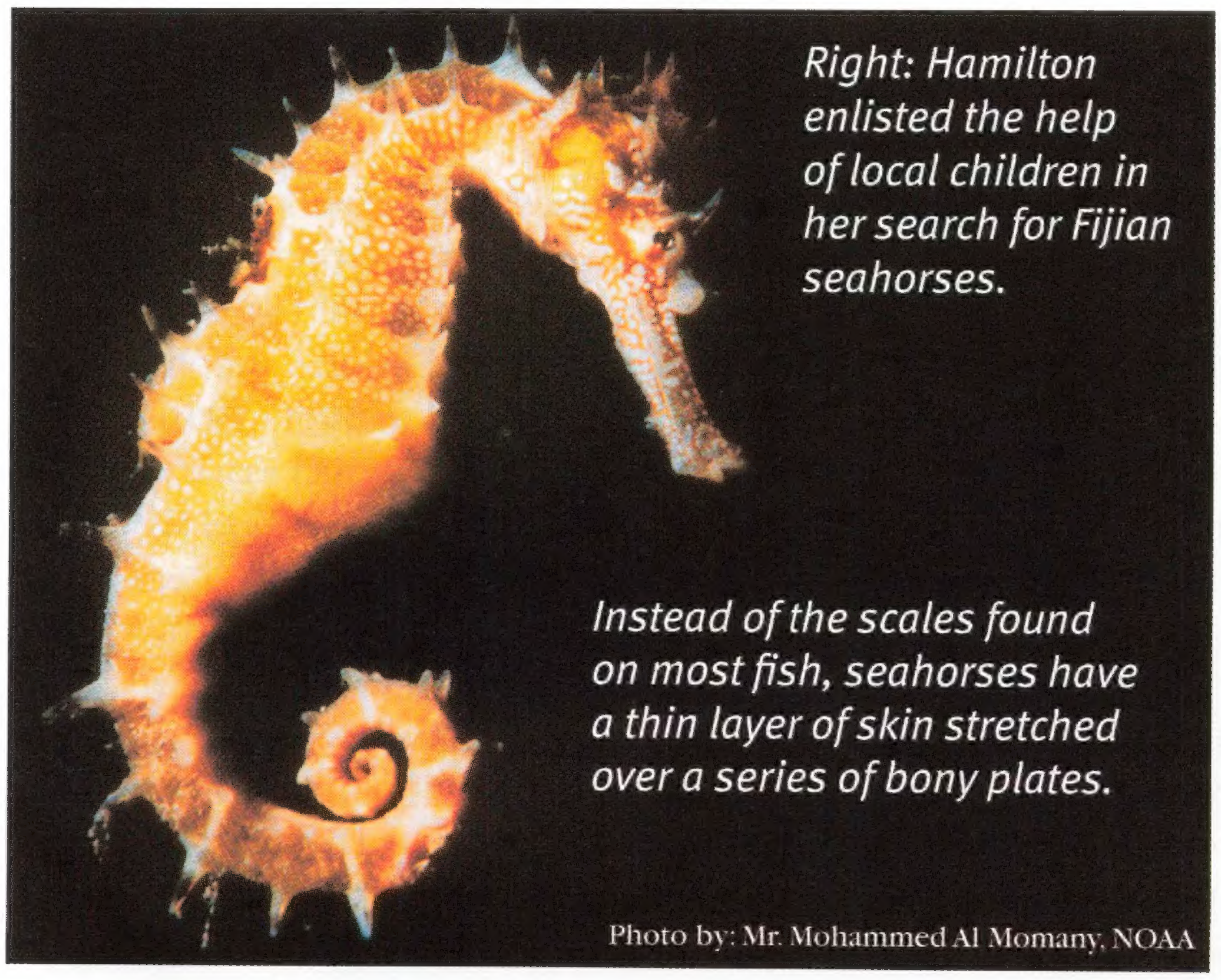
Enforcing this agreement, however, is currently quite challenging because it is difficult to determine the species and geographic origin of seahorses found in international trade. About 35 species of seahorses are currently recognized by scientists. However, more than 120 species names have been proposed for seahorses over the past 200 years, a tangled taxonomic history that arose in part because seahorses can change color and grow skin filaments to blend in with their surroundings.

To eliminate some of this confusion and create a tool for more effective enforcement, Academy scientist Healy Hamilton began to build a bank of DNA data, sequencing three different genes from as many seahorse species as possible and posting them on a publicly accessible web site. The site, appropriately named Seahorse Sleuth, allows scientists from around the world to determine the identity of any seahorse on the market by sequencing a single gene and comparing their results to Hamilton's database. If the identity of a live animal is in question, a tiny fin clip provides enough genetic material to run the test. The procedure, which is now widely available, can also be run on dried seahorses, allowing scientists to determine where the specimens found in Asian markets are coming from.

So far, Hamilton has added gene sequences from 25 different species of seahorses into her growing database, including all of the most commonly collected species. The Seahorse Sleuth site is now up and running (www.seahorsesleuth.org), and it has already turned up some surprising information about the seahorses in San Francisco's Chinatown neighborhood. "I expected most of the specimens in the traditional Chinese medicine shops to come from Southeast Asia," says Hamilton, "but a surprising number of them turned out to be *Hippocampus ingens*, the coastal Pacific species that can be found in San Diego Bay."

The threat of seahorse extinction first hit home for Hamilton during a trip to Fiji. She had sailed out to the far eastern end of the Fijian islands to search for *Hippocampus kuda*, a species that had historically been recorded in the area. The scientific community suspected that the *H. kuda* name may actually encompass several distinct species, so Hamilton hoped to clip some fin samples for DNA analysis. She spent four weeks diving in pristine eastern Fijian waters in her search for the elusive seahorse, and once the local residents learned what she was looking for, the whole village came out to help. Even with the extra assistance, however, she didn't find a single seahorse. The village elders called a meeting to discuss the changes they had noticed in the marine life over the years, which included an increase in algae—probably a consequence of over-fishing. "It was such a pristine area, with virtually no pollution," says Hamilton. "I never expected that seahorses would be in trouble there."

She knew then that she wanted to start Seahorse Sleuth in an effort to prevent seahorses from disappearing in other places. She found funding for the project several years later when she met Graham Short, a web developer whose first love is marine biology. Short built the Seahorse Sleuth web site and provided funding for the DNA sequencing. He has also helped Hamilton collect DNA samples in the field. In March, they spent four weeks collecting samples off the coast of southern Australia, the epicenter of biodiversity for the seahorse order. This coming November, they will travel to Indonesia to search for species with a more northern distribution. The DNA



Instead of the scales found on most fish, seahorses have a thin layer of skin stretched over a series of bony plates.

Photo by: Mr. Mohammed Al Momany, NOAA

Right: Hamilton enlisted the help of local children in her search for Fijian seahorses.

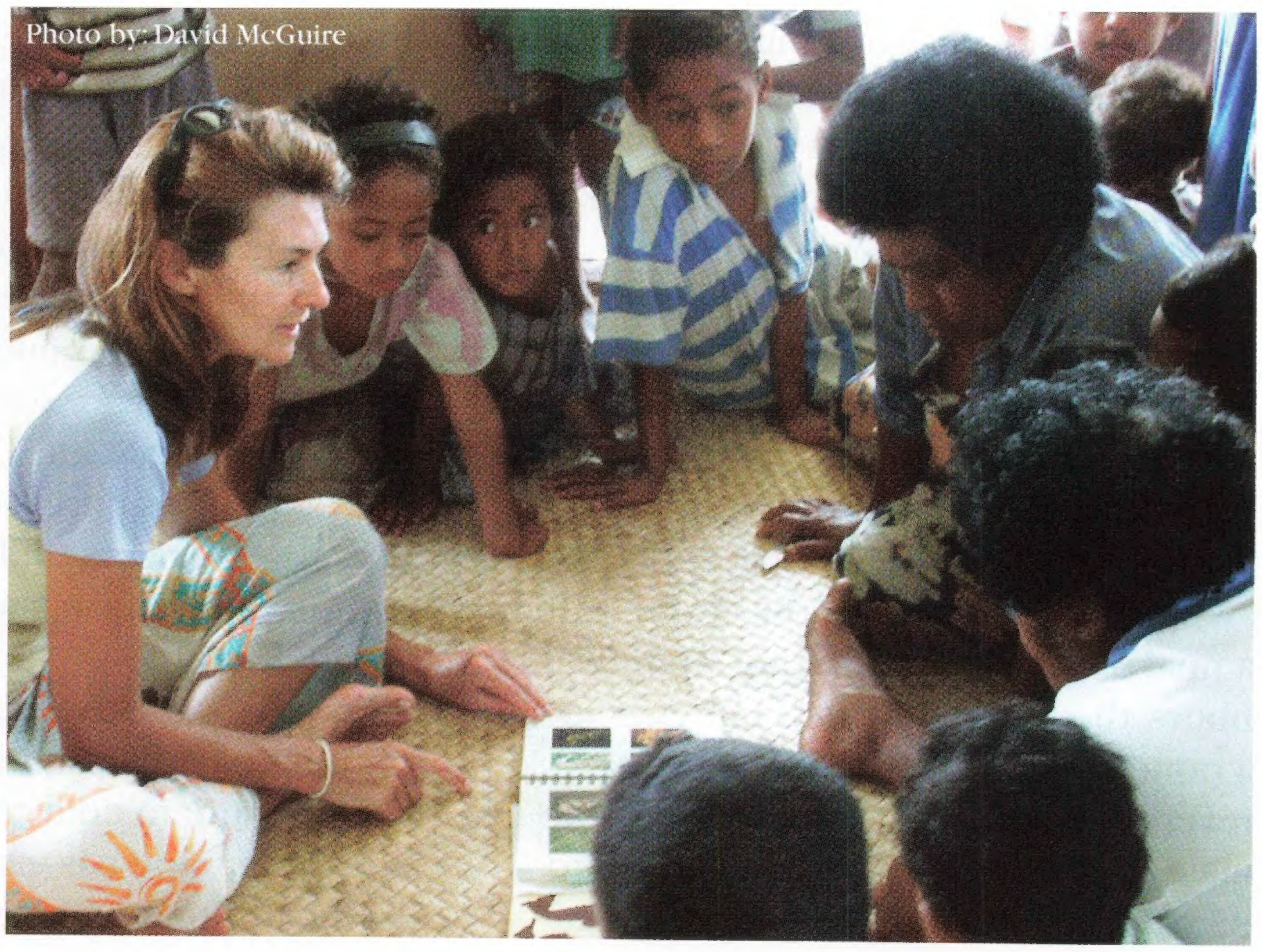


Photo by: David McGuire

The large Australian big-bellied seahorse (Hippocampus abdominalis) can reach almost a foot in height.

Below: A pygmy seahorse (Hippocampus bargibanti) hides in a Muricella coral. Better adapted to maneuverability than speed, seahorses rely heavily on camouflage to avoid predators.

Photo by: Graham Short

data they collect will be added to the Seahorse Sleuth database.

This genetic data will help international enforcement agencies determine which species are most heavily targeted for the illegal seahorse trade. It can also be used to inform the establishment of new marine protected areas. "In twenty years, I hope we will have an effective, science-based management plan for the persistence of seahorse populations," says Hamilton. "And by saving these charismatic ambassadors of the world's tropical and temperate coastal ecosystems, we can also save their threatened habitats."

Dr. Healy Hamilton will give two lectures about seahorses at the Academy on Tuesday, June 12. See page 7 for more information.

Photo by: Graham Short

JUNE, JULY, & AUGUST

Penguin Feeding

Every Day

11:00am & 3:30pm

Watch the Academy's African penguins dip and dive in their tank and maintain their shelters. Every day at 11 am and 3:30 pm, visitors can enjoy feeding shows and ask questions as an aquatic biologist dons a wet suit, takes temperature measurements, and then tosses vitamin-stuffed herring and capelin to the penguins. Each feeding takes 20 minutes.

Coral Reef Caretaking

Every Monday and Wednesday

2:00pm

Watch as an Academy biologist suits up in SCUBA gear and dives into the Academy's two-story Coral Reef tank to care for the reef's inhabitants. During this 20-minute dive, the biologist will clean the tank windows and feed the anemones and fish. A second biologist will be on hand to answer questions.

Snake Feeding

Every Friday

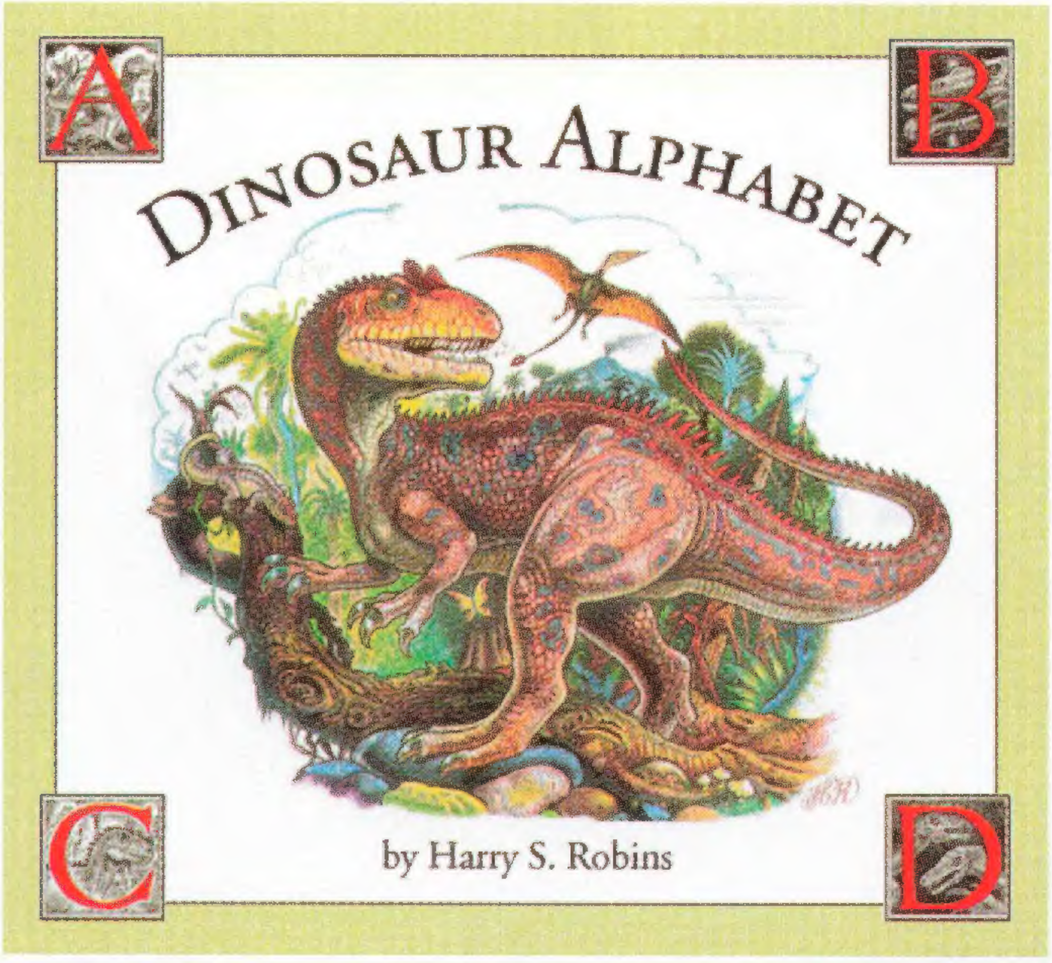
2:00pm

Watch as an Academy biologist feeds the anaconda, python, vine snakes, and more, while answering all your SSsssnake-related questions.

Story Time

Every Saturday

10:30am



Explore nature with a story for children ages 3-5. On June 23, join us for a special Story Time with author and artist Harry S. Robins, a gifted cartoonist and long-time dinosaur buff. Robins will read from his new book, *DINOSAUR ALPHABET*, which brings 26 different dinosaurs to life with poems, illustrations, and an expanded notes section. Signed copies will be available.

Meet the Biologist

Every Saturday & Sunday

2:00pm

Meet an Academy biologist and discover how to care for aquarium creatures. Depending on the animal you visit, you may learn how to take and test water samples, check filters, clean tanks, or administer appropriate amounts of food.

Behind-the-Scenes Fish Tours

June 8, 13, 22

July 11, 13, 27

August 8, 10, 24

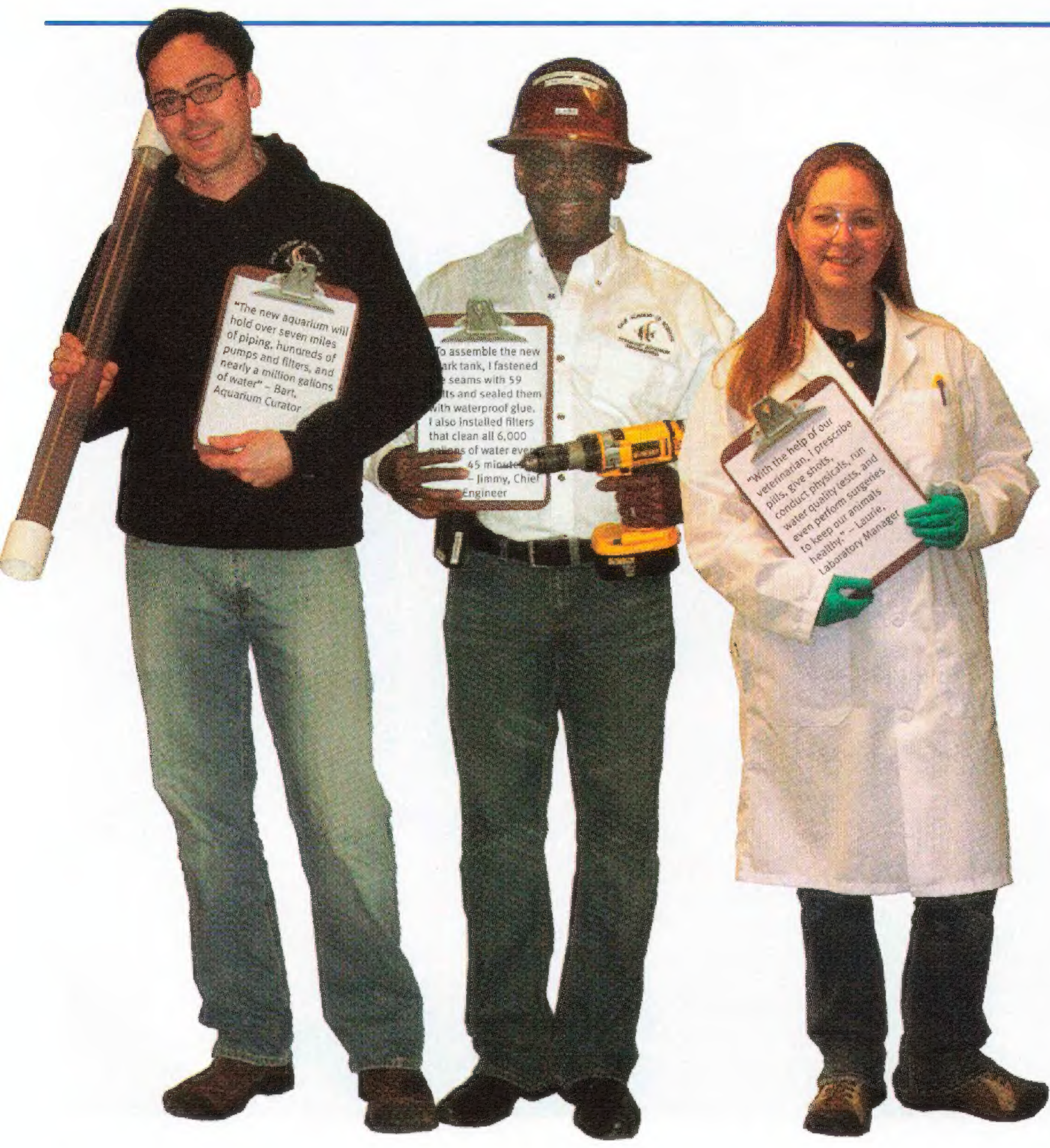
10:30 am-Noon

$10 Academy members

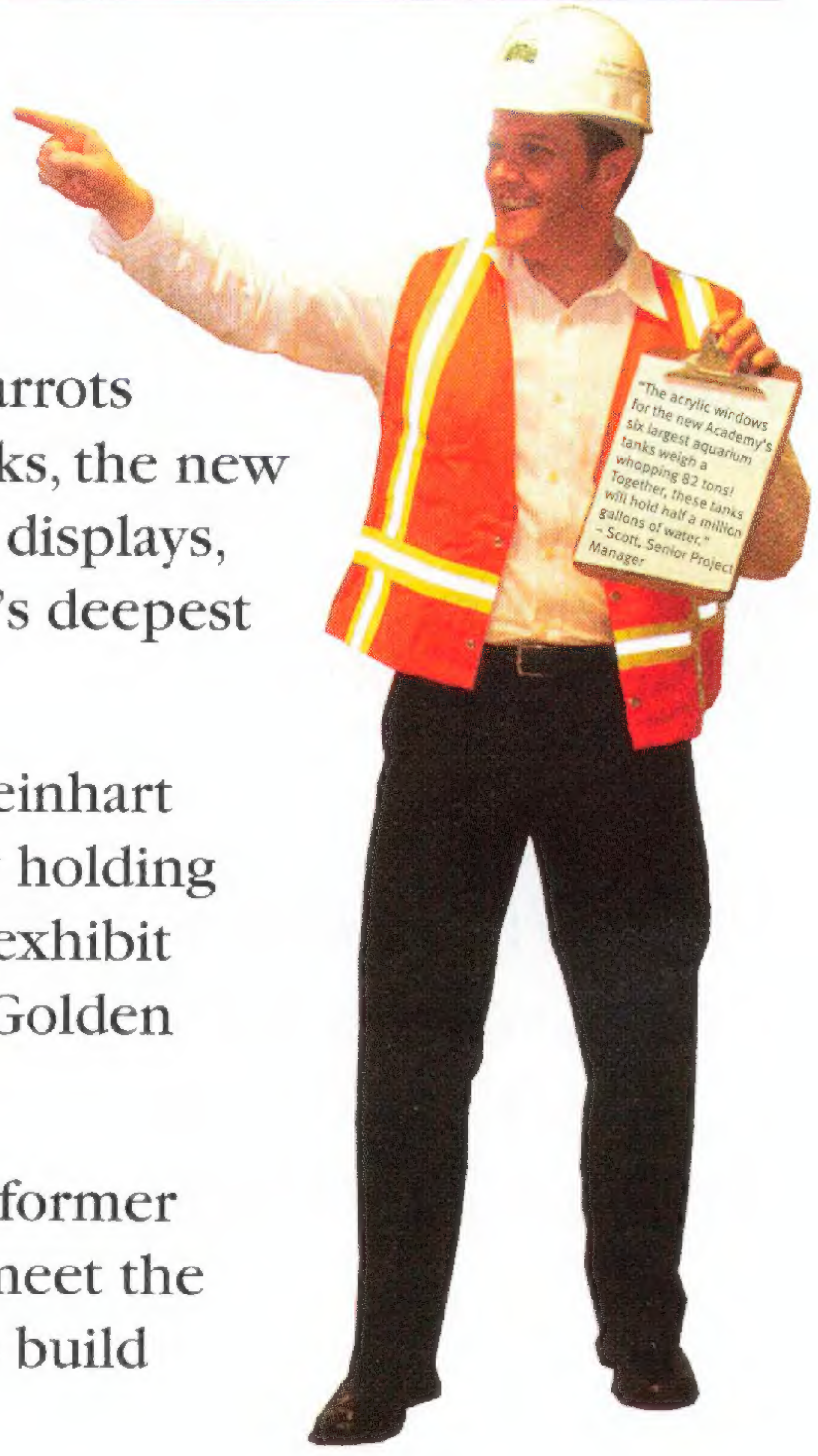
$15 non-members (plus admission)

Registration required (415) 321-8000

Wander through the Academy's collection of over 200,000 bottled ichthyology specimens, see the water filtering systems for the Aquarium, watch Steinhart biologists prepare food for the animals, and learn about the coral rearing pods. This fun and fascinating tour led by Academy docents will tickle your curiosity.


"The new aquarium will hold over seven miles of piping, hundreds of pumps and filters, and nearly a million gallons of water" – Bart, Aquarium Curator
To assemble the new ark tank, I fastened e seams with 59 lts and sealed them with waterproof glue. I also installed filters that clean all 6,000 gallons of water eve 45 minute – Jimmy, Chief Engineer
"With the help of our veterinarian, I prescribe pills, give shots, conduct physicals, run water quality tests, and even perform surgeries to keep our animals healthy." – Laurie, Laboratory Manager

Preparing for the Park


"The acrylic windows for the new Academy's six largest aquarium tanks weigh a whopping 82 tons! Together, these tanks will hold half a million gallons of water." – Scott, Senior Project Manager

The new Academy building, which is rapidly rising in Golden Gate Park, will soon house over 38,000 Steinhart Aquarium animals, from frogs and fish to parrots and penguins. In addition to hundreds of smaller tanks, the new aquarium will include a number of spectacular large displays, including a four-story living rainforest and the world's deepest living coral reef display.

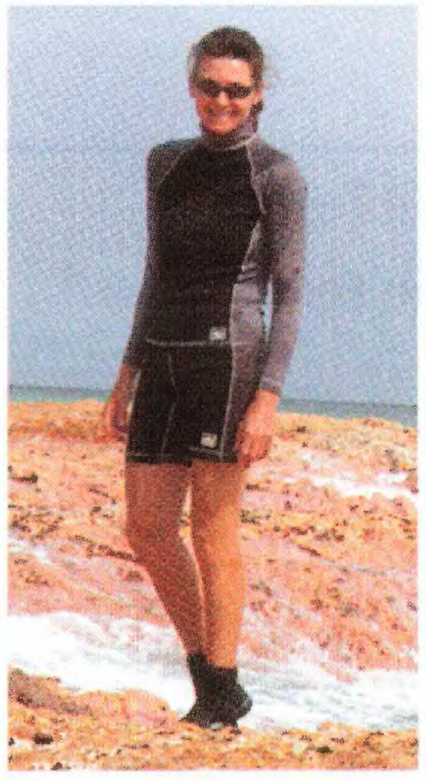
To prepare for the opening of these new exhibits, Steinhart Aquarium biologists are currently busy building new holding tanks, acquiring new animals, and working with the exhibit designers and contractors to create new habitats in Golden Gate Park.

During your next visit to Howard Street, stop by the former home of the *Dinosaurs* exhibit on the first floor to meet the Academy's newest animals and learn what it takes to build their new home.

ACADEMY LECTURES

Location: Sequoia Boardroom, California Academy of Sciences
Tickets: Free for Academy members, $8 non-members.
Tickets can be purchased by calling (415) 321-8000 or at the door, when available.
Also available online at: https://www.calacademy.org/lectures/tickets/

Seahorses: Magical, Threatened Fishes of the Coastal Oceans

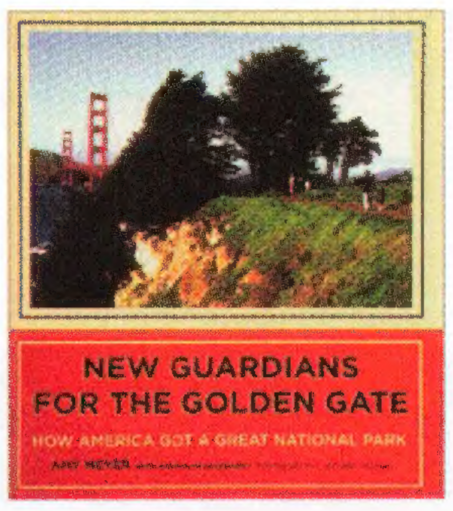


Healy Hamilton, Ph.D.
Head, Center for Biodiversity Research & Information
Lead Scientist, Seahorse Research & Conservation Program

Tuesday, June 12
2:00 pm & 7:30 pm

With their horse-like heads and monkey-like tails, armor-plated bodies, independently moving eyes and color-changing skin, seahorses are some of the world's most amazing fishes. Their behavior is equally remarkable: many species bond in faithful pairs and sex role reversal occurs when the males become pregnant. Recognizing them as charismatic ambassadors for coastal ocean education, Hamilton and her group use genetic techniques to answer important questions about seahorse biology, behavior, and conservation status at the Academy's newly formed Seahorse Research & Conservation Program. The Academy has a long history of involvement with seahorses, from the famous seahorse railing around the swamp, to being one of the first aquaria to successfully breed seahorses in captivity. Come hear the latest episode in the Academy's mission to explore, explain, and protect the world of the seahorse!

New Guardians for the Golden Gate

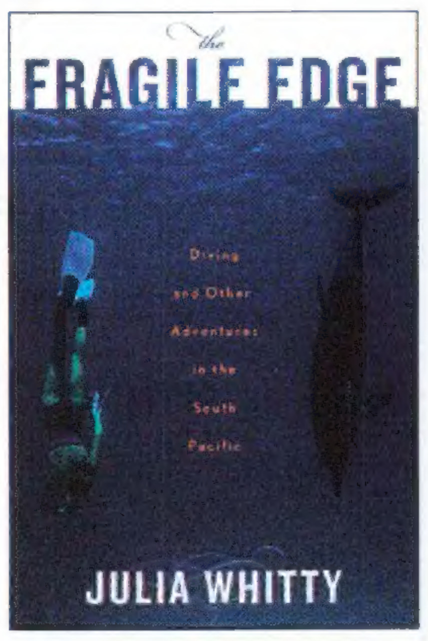

NEW GUARDIANS FOR THE GOLDEN GATE
HOW AMERICA GOT A GREAT NATIONAL PARK
AMY MEYER

Amy Meyer, author

Tuesday, July 17
2:00 pm & 7:30 pm

Bay Area residents enjoy the largest national park of any American urban area. Though seemingly immune to development, the Golden Gate National Recreation Area was at one time under threat and was only preserved through the efforts of community advocates who fought for the protection of these 80,000 acres. In this lecture, Meyer spans more than 35 eventful years and shows how dedicated citizens made our democratic system work for the common good by winning the fight to save these dramatic and historic lands. This timely topic anticipates the imminent opening of the new Academy back in Golden Gate Park at the end of 2008.

The Fragile Edge: Wonders and Warnings from the Oceans



Julia Whitty, author, documentary filmmaker

Tuesday, August 21
2:00 pm & 7:30 pm

Julia Whitty's work has kept her at sea for much of the past 25 years, exploring the underwater and topside worlds of coral reefs in the South Pacific, ocean currents in the North Atlantic, Norwegian fjords, and deep-sea vents in the Pacific, to name a few. Along the way she has spent many seasons working with wild marine mammals, including Atlantic spotted dolphins, spinner dolphins, killer whales, humpback whales, gray whales, blue whales, manatees, and elephant seals. Alongside these wonders, Whitty has also seen the threats to the ocean grow and spread, as local troubles have gone global in only 25 years. Join Whitty as she features photographs and tales from her new book, *The Fragile Edge*. A book signing will follow the lecture.

BENJAMIN DEAN LECTURES

All programs begin at 7:30 pm in Kanbar Hall at the Jewish Community Center of San Francisco, 3200 California Street. Tickets are $4 at the door or by mail.

"Cosmic Jackpot"

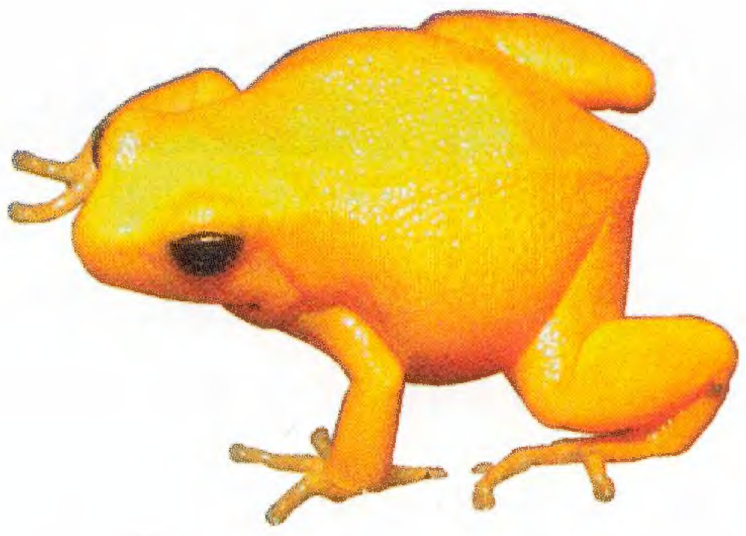
Dr. Paul Davies, Arizona State University

Monday, 4 June

Scientists have long known that the Universe is particularly well suited for the development of life. How can we explain this? Are we winners in a cosmic lottery of co-existing universes? Using recent scientific discoveries and radical thought about the cosmos, Davies discovers a more subtle process at work.

JUNE

Please see Programs & Highlights on page 6 for a full description. For more information, check our website: *www.calacademy.org*.



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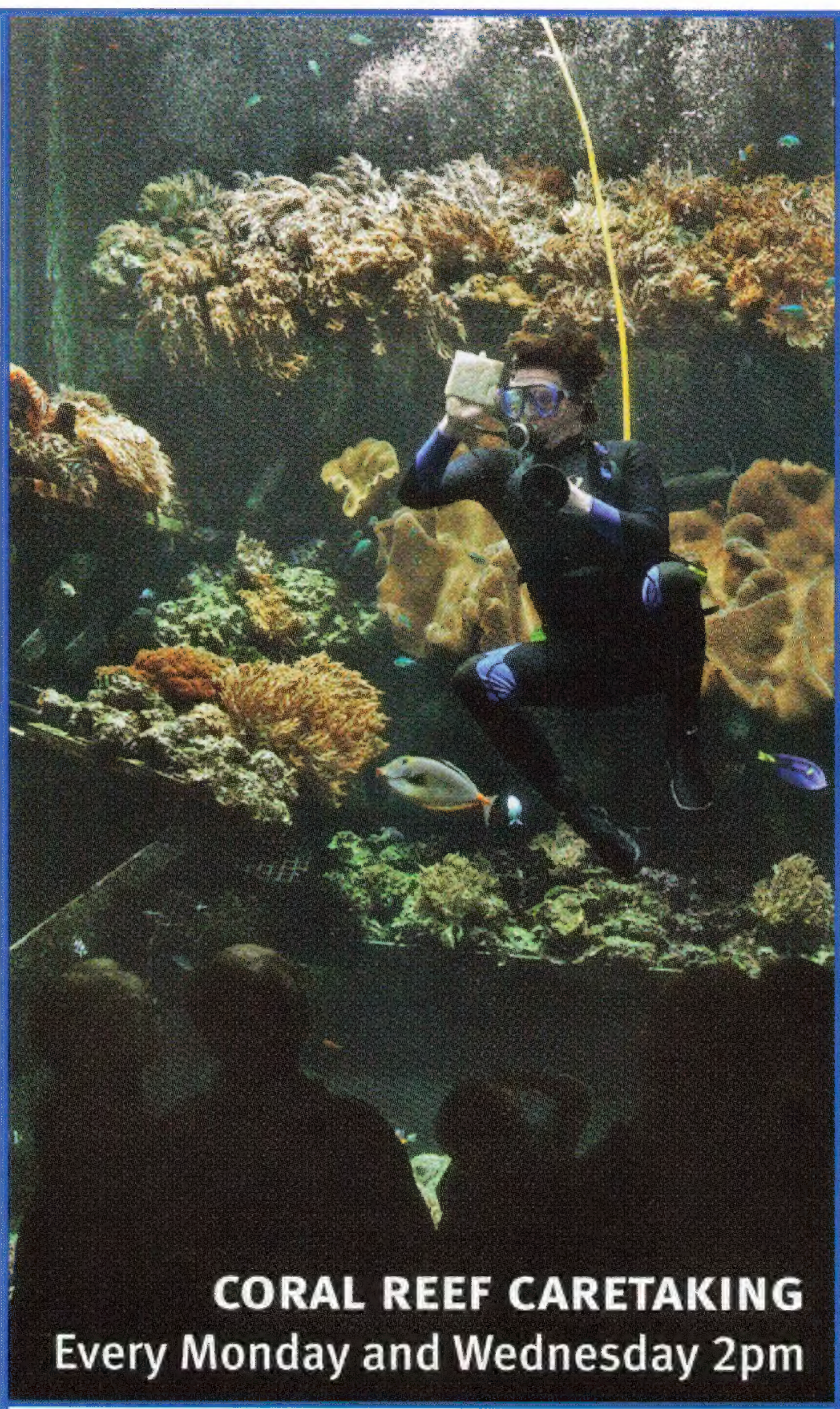
3 Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm	 **CORAL REEF CARETAKING** Every Monday and Wednesday 2pm	**5** Penguin Feeding 11:00am Penguin Feeding 3:30pm	**6** Penguin Feed Coral Reef Car Penguin Feed
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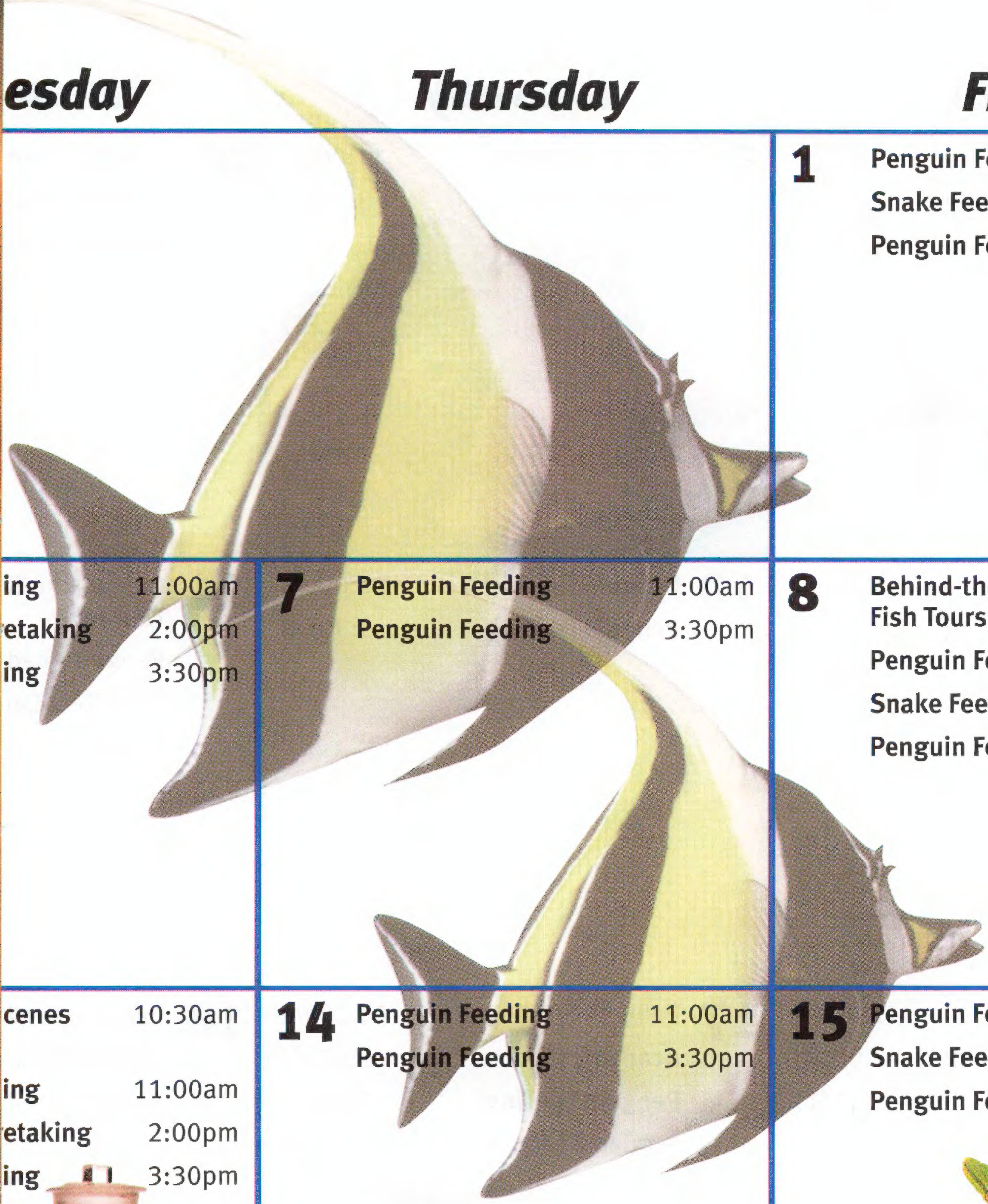

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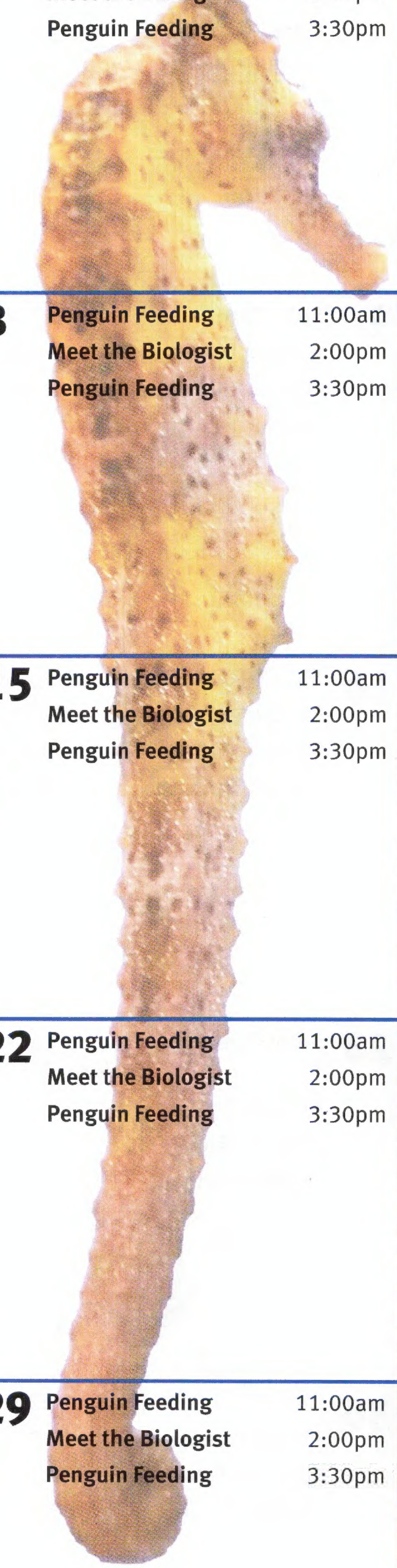

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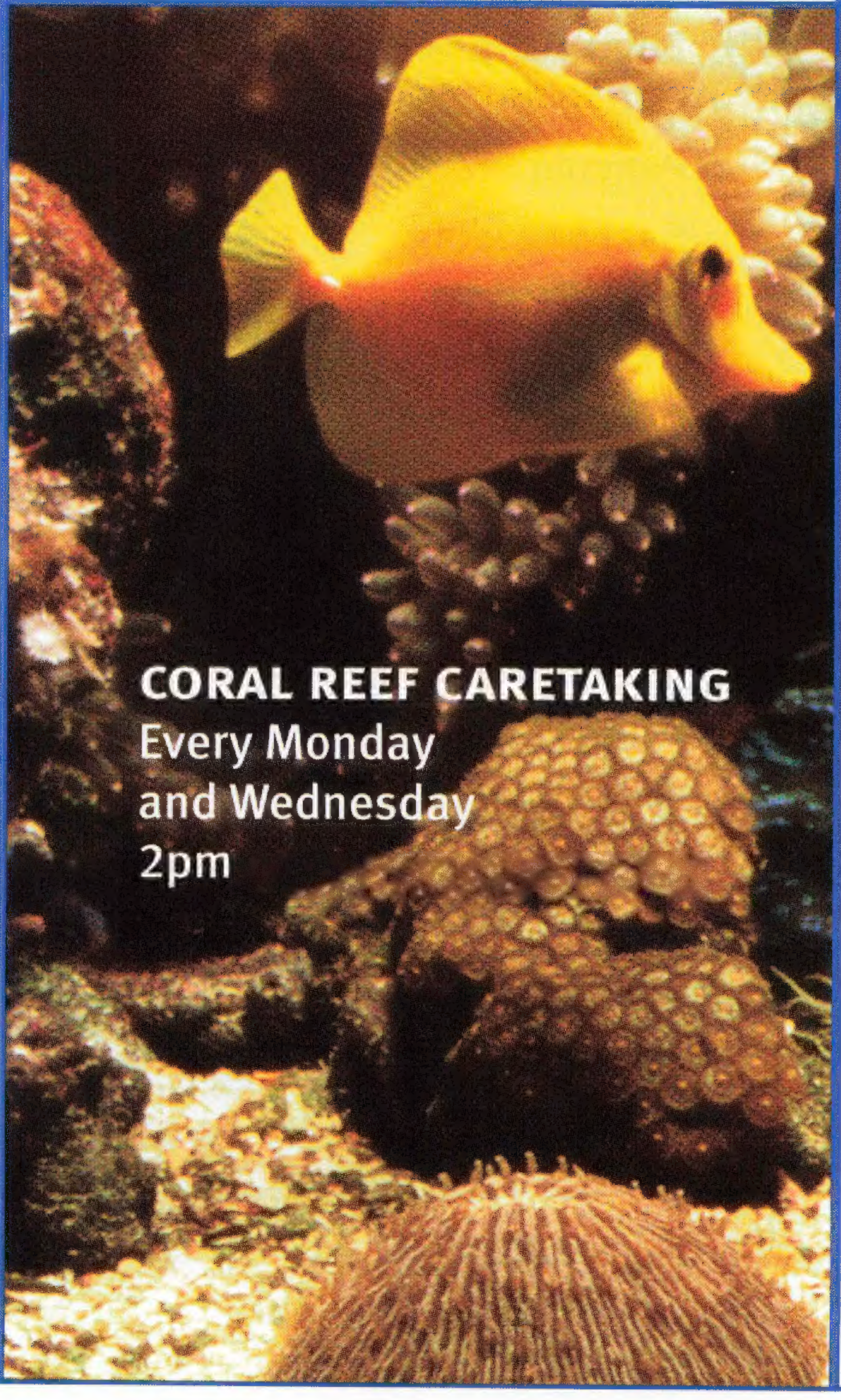
22 Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm	 **CORAL REEF CARETAKING** Every Monday and Wednesday 2pm	**24** Penguin Feeding 11:00am Penguin Feeding 3:30pm 	**25** Penguin Feed Coral Reef Car Penguin Feed
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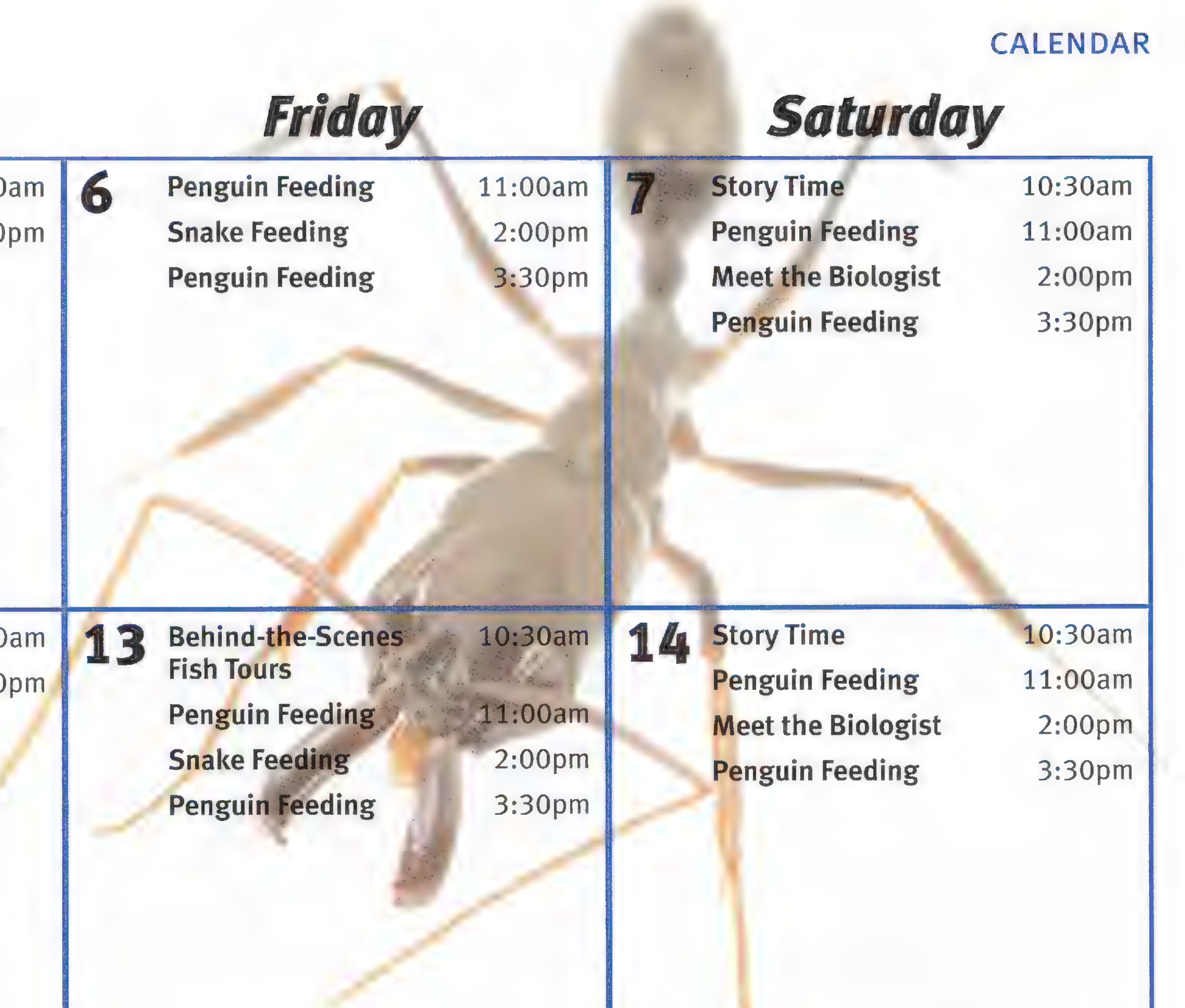

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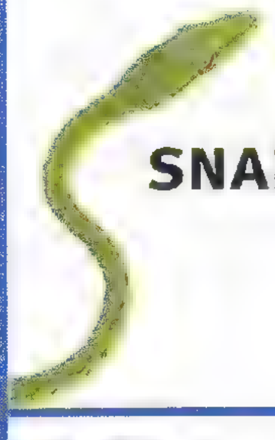
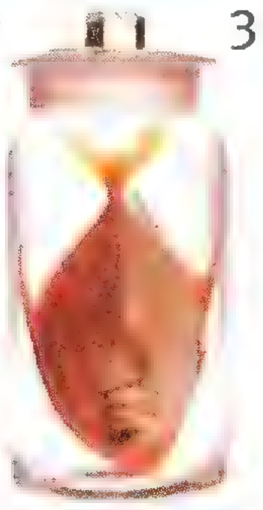
ng 11:00am etaking 2:00pm ng 3:30pm	**19** Penguin Feeding 11:00am Penguin Feeding 3:30pm 3rd Thursday 5:00pm 3rd THURSDAYS CLOWNFISH, CORALS & COCKTAILS CONVERGE	**20** Penguin Feeding 11:00am Snake Feeding 2:00pm Penguin Feeding 3:30pm  SNAKE FEEDINGS Every Friday 2pm	**21** Story Time 10:30am Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm
ng 11:00am etaking 2:00pm ing 3:30pm	**26** Penguin Feeding 11:00am Penguin Feeding 3:30pm	**27** Behind-the-Scenes Fish Tours 10:30am Penguin Feeding 11:00am Snake Feeding 2:00pm Penguin Feeding 3:30pm 	**28** Story Time 10:30am Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm

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NATURE NEST
Every Day
10am-5pm

JULY

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AUGUST

Please see Programs & Highlights on page 6 for a full description. For more information, check our website: *www.calacademy.org*.

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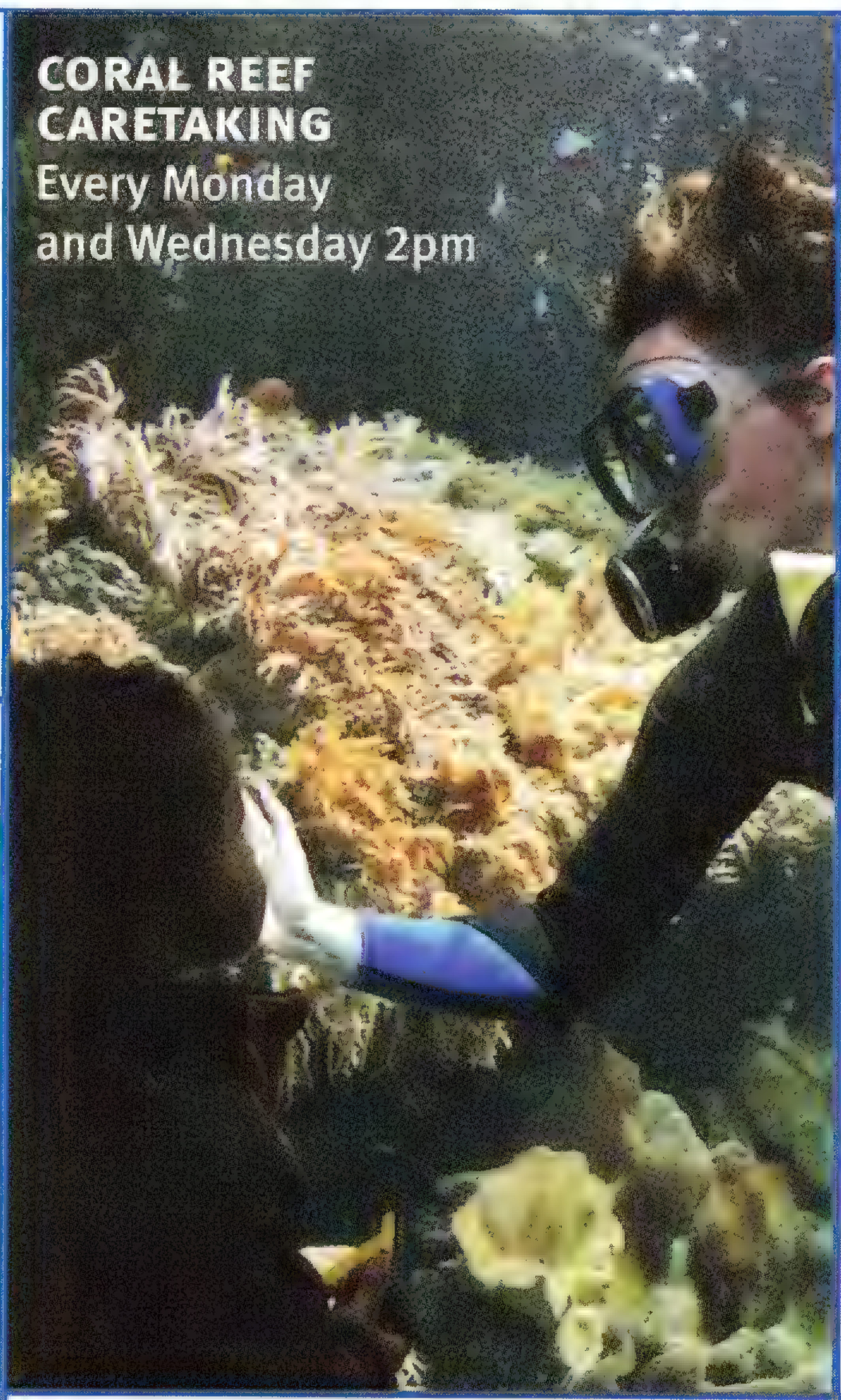
5 Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm 	 **CORAL REEF CARETAKING** Every Monday and Wednesday 2pm	**7** Penguin Feeding 11:00am Penguin Feeding 3:30pm	**8** Behind-the-S Fish Tours Penguin Feec Coral Reef Ca Penguin Feec
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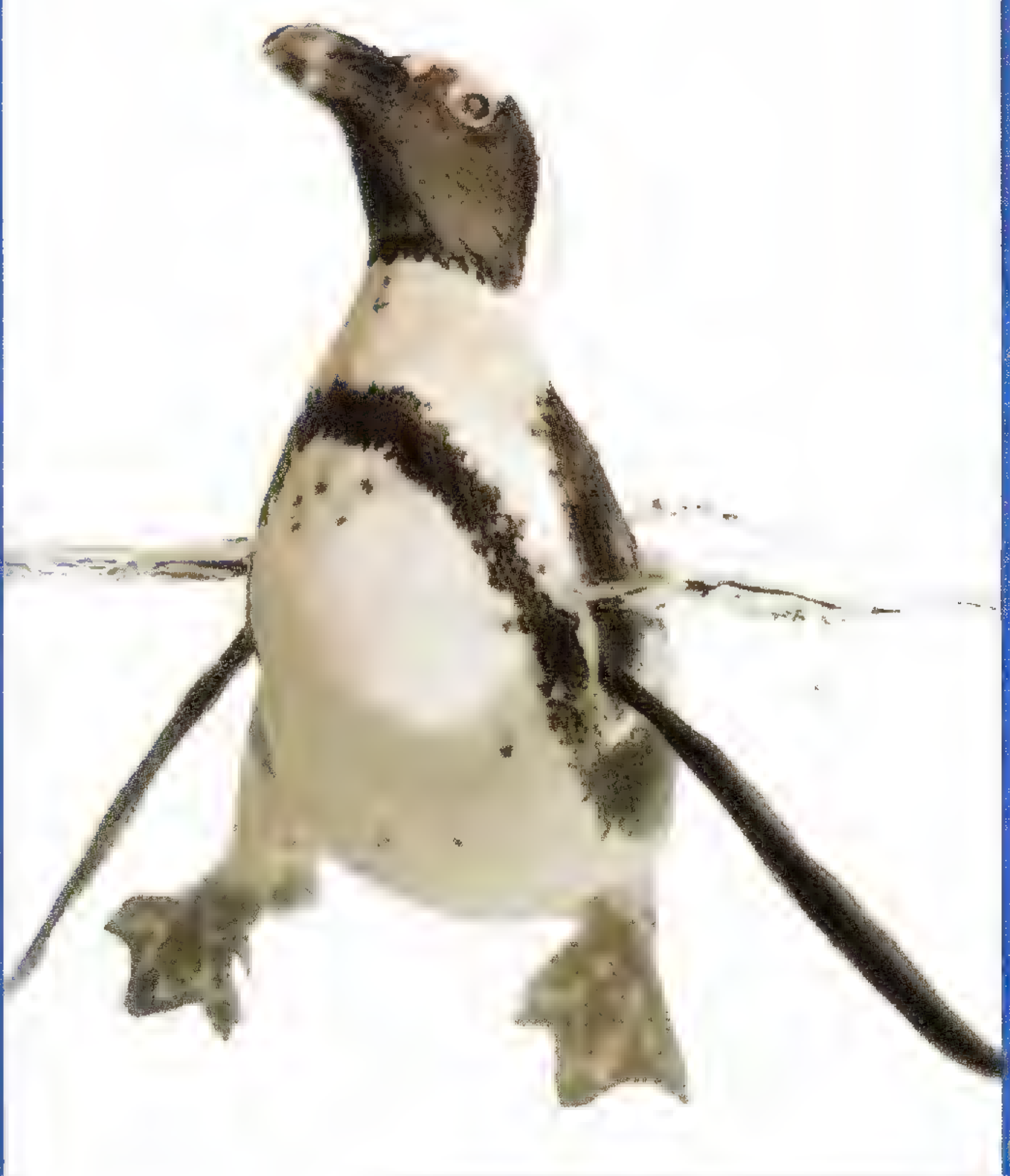
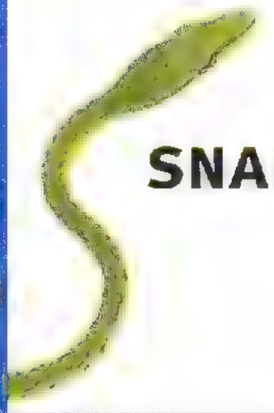
ng 11:00am etaking 2:00pm ng 3:30pm	**PENGUIN FEEDING** Every Day 11am & 3:30pm 	**24** Behind-the-Scenes Fish Tours 10:30am Penguin Feeding 11:00am Snake Feeding 2:00pm Penguin Feeding 3:30pm 	**25** Story Time 10:30am Penguin Feeding 11:00am Meet the Biologist 2:00pm Penguin Feeding 3:30pm
ing 11:00am etaking 2:00pm ing 3:30pm		**31** Penguin Feeding 11:00am Snake Feeding 2:00pm Penguin Feeding 3:30pm  **SNAKE FEEDINGS** Every Friday 2pm	

June 14 ●

New Moon. Tomorrow evening (the 15th), sighting of the day-old crescent just after sunset marks the start of the month known as Jumada-at-Thani in the lunar-based Islamic calendar.

June 21

Summer Solstice for the Northern Hemisphere. Once considered Mid-Summer's Day, the solstice is now commonly considered the beginning of Summer. It occurs at 11:11 am PDT, when the Sun is farthest north of the celestial equator. On this day the Sun rises and sets at its most northerly points on the horizon, making its longest and highest arc across the sky. In the Southern Hemisphere, the seasons are reversed, and this day is the shortest of the year, marking the start of Winter.

June 30 ○

Full Moon, also called the "Windy Moon" by the Choctaw, the "Rotten Moon" by the Wisham, and the "Corn Moon" by the Laguna. While the full Moon in Winter arcs high across the sky, watch how low Summer's full Moon, located in Sagittarius, crosses the heavens.

July 14 ●

New Moon. On the evening of the 15th, sighting of the first, young crescent low in the west after sunset marks the start of the month Rajab in the Islamic calendar.

July 29 ○

Full Moon, located against Capricornus; known to the San Ildefonso as the "Rain Moon," to the Choctaw as the "Crane Moon," and to the Ojibway as the "Raspberry Moon."

August 12 ●

New Moon. Sighting of the thin, young crescent just after sunset tomorrow marks the start of the month called Sha'ban in the Islamic calendar.

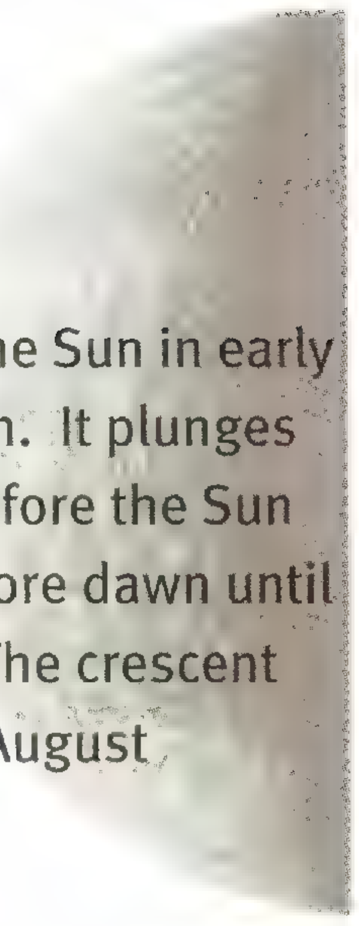
August 13 ☄

Peak of the annual ***Perseid meteor shower,*** averaging about 50 meteors per hour. Since this year's shower coincides with a new Moon, viewing prospects are outstanding – recommended viewing time is late evening of the 12th through the pre-dawn hours of the 13th.

August 28 ○

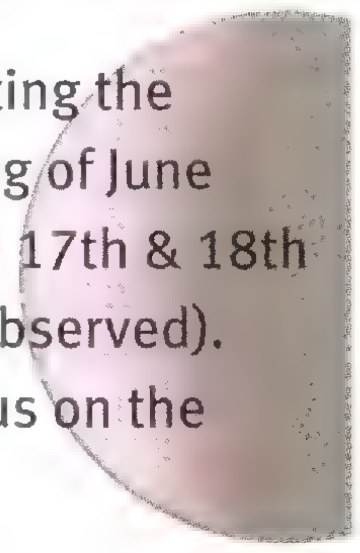
Full Moon in Aquarius. Also called the "Autumn Moon" by the Taos, the "Time of Freshness" by the Mohawk, and the "Collect Food for Winter Moon" by the Haida. A total lunar eclipse occurs, centered over the Pacific Rim. For observers in the United States, it starts after midnight (later farther east), during the predawn hours of the 28th. The Moon slips into the Earth's reddish shadow at 1:50 am and becomes totally immersed at 2:25 am, with mid-eclipse at 3:37 am, and exiting at 4:23 am (times given are PDT).

The Planets



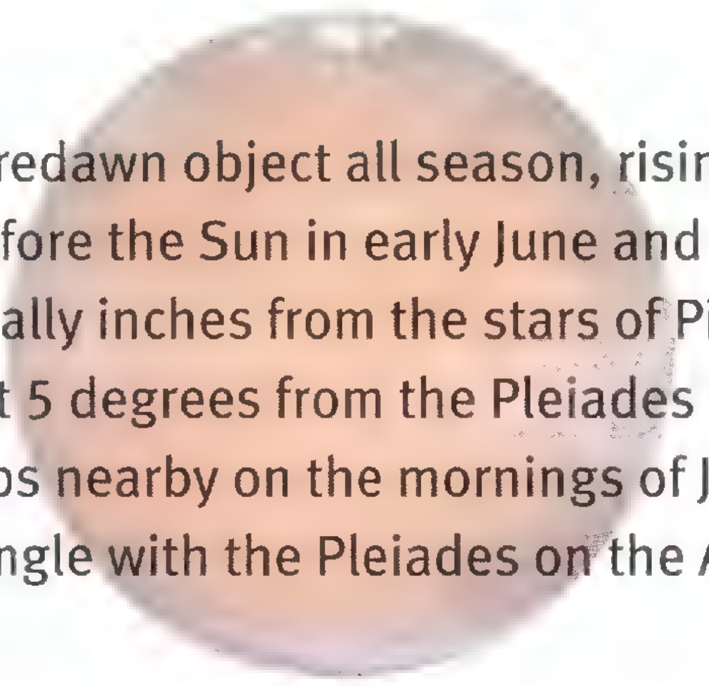
Mercury

Always-elusive Mercury is at greatest elongation (or maximum separation) east of the Sun in early June, so it may be seen low in the west very soon after sunset until about mid-month. It plunges into the Sun's glow by month's end and reappears in the morning sky, rising just before the Sun around mid-July. Reaching greatest elongation west on the 20th, it can be seen before dawn until the end of the month. Darting back into the Sun's glow, it is not visible in August. The crescent Moon passes nearby on the evening of June 15th and the morning of July 13th. Its August meeting with Mercury takes place too close to the Sun to be observed.



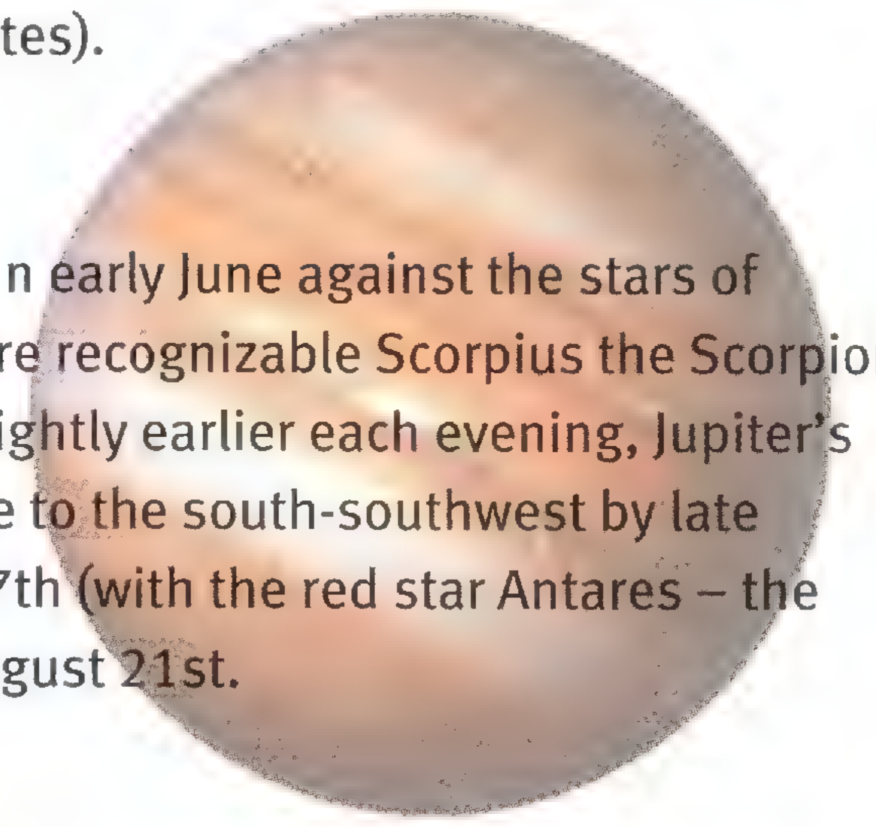
Venus

Reaching greatest brilliancy in mid-July, Venus is spectacular after sunset, dominating the western sky like a beacon. Watch for its close encounter with Saturn on the evening of June 30th, when the two are less than a degree apart. The Moon passes nearby on June 17th & 18th and July 16th & 17th (its August encounter takes place too close to the Sun to be observed). Watch for the wonderful clustering of the Moon, Venus, Saturn, and the star Regulus on the evening of July 16th!



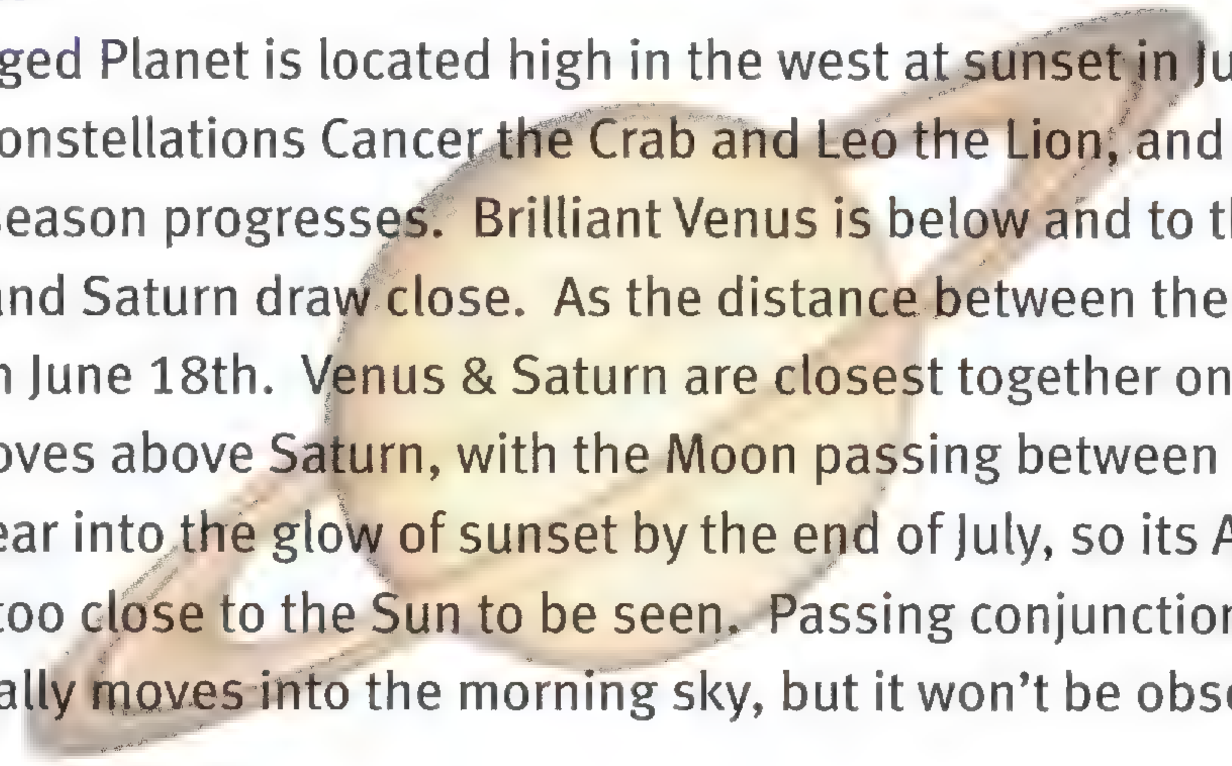
Mars

The Red Planet is a predawn object all season, rising slightly earlier from night to night – it rises about three hours before the Sun in early June and at about midnight by the end of August. As time passes, it gradually inches from the stars of Pisces the Fishes to those of Taurus the Bull, approaching to about 5 degrees from the Pleiades star cluster in early August. The waning crescent Moon sweeps nearby on the mornings of June 10th, July 9th, and August 6th & 7th (forming a pretty triangle with the Pleiades on the August dates).



Jupiter

At opposition on June 5th, the largest planet rises at sunset in early June against the stars of Ophiuchus the Serpent-Bearer, with the brighter stars of more recognizable Scorpius the Scorpion just to the south, between Jupiter and the horizon. Rising slightly earlier each evening, Jupiter's location slowly migrates from the southeast at sunset in June to the south-southwest by late August. Look for the Moon nearby on the evenings of June 27th (with the red star Antares – the heart of Scorpius – between them), July 24th & 25th, and August 21st.



Saturn

The Ringed Planet is located high in the west at sunset in June, nestled between the main stars of the constellations Cancer the Crab and Leo the Lion, and gradually appears lower in the west as the season progresses. Brilliant Venus is below and to the right, but watch through June as Venus and Saturn draw close. As the distance between them narrows, the Moon appears between them on June 18th. Venus & Saturn are closest together on the evening of June 30th. Venus then moves above Saturn, with the Moon passing between them again on July 16th. Saturn will disappear into the glow of sunset by the end of July, so its August 12th encounter with the Moon occurs too close to the Sun to be seen. Passing conjunction with the Sun on August 21st, Saturn technically moves into the morning sky, but it won't be observable until about mid-September.

	SUNRISE	LOCAL NOON	SUNSET
JUNE 1	5:49 AM PDT	1:08 PM PDT	8:26 PM PDT
JULY 1	5:51 AM PDT	1:14 PM PDT	8:36 PM PDT
AUGUST 1	6:13 AM PDT	1:16 PM PDT	8:18 PM PDT

(Times are for San Francisco, CA, and will vary slightly for other locations.)

IN PURSUIT OF THE PERFECT PERSEIDS

The annual Perseid meteor shower occurs when Earth passes through the trail of dust particles from Comet Swift-Tuttle, which was discovered in 1862 and whose elongated orbit brings it through the inner solar system every 130 or so years. Typically known as one of any year's more reliable and spectacular showers, the Perseids peak every August 12th and usually average at least 50 meteors per hour. If followed backward, the paths of the meteors seen would appear to converge at a point called the "radiant," located in the constellation Perseus, after which the shower is named. While viewing can often be spoiled by the glaring light of a bright Moon, meteor-watchers can take heart: this year's peak coincides with a new Moon, assuring (weather-permitting) a dark night unobscured by moonlight.

* * *

The best time to observe the Perseid shower is between midnight and dawn (that is, the early morning hours of the 13th), when the observer's side of Earth is facing into the direction Earth is moving through the trail of comet dust. This is when the shower's radiant is above the horizon, affording a greater chance to see more meteors than when the radiant is below the horizon. However, early in the evening on the 12th, when the radiant is just rising, there's a chance that some bright meteors may be seen grazing tangentially through the atmosphere, creating long, bright trails called, appropriately-enough, "Earthgrazers."

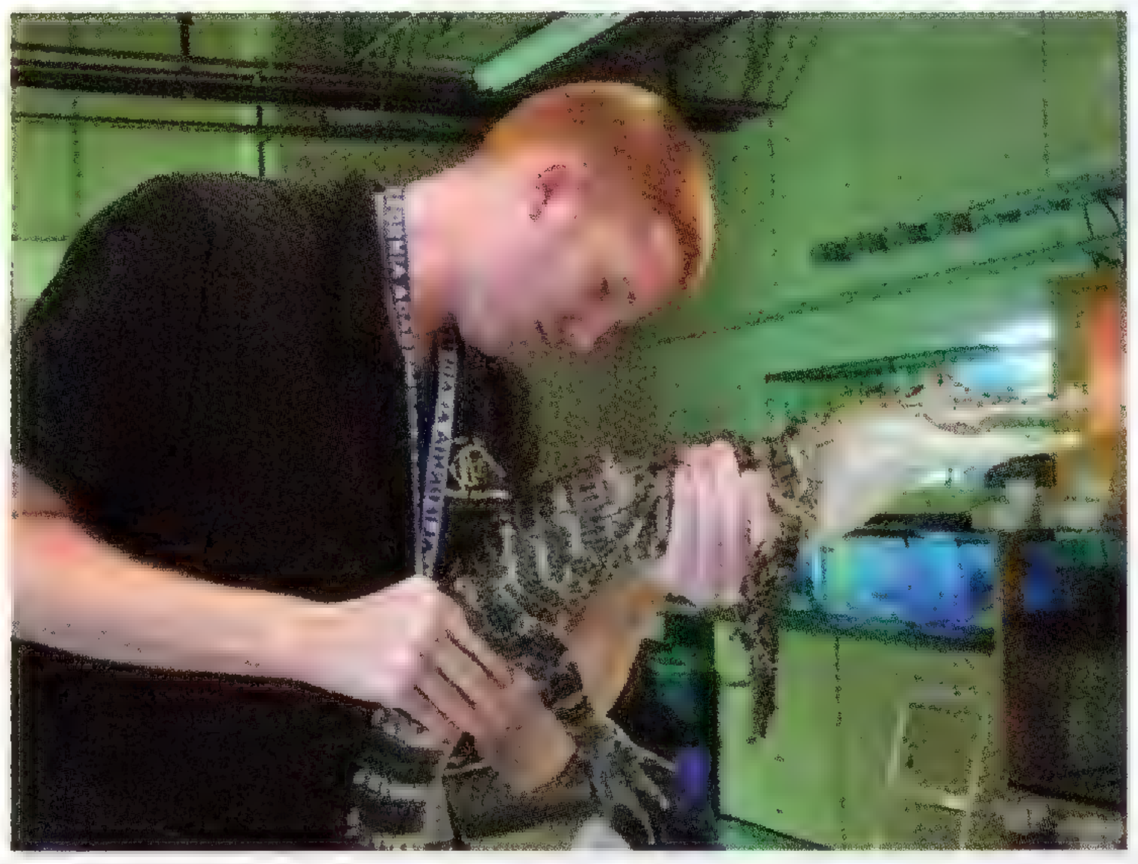
Morrison Planetarium Welcomes New Director

On April 23, Ryan Wyatt joined the Academy as the new Director of Morrison Planetarium and Science Visualization. Wyatt, who came to the Academy from the American Museum of Natural History in New York, will use the latest science visualization technologies to produce groundbreaking programs for the new Morrison Planetarium. "Today's technology allows us to convey scientific concepts with unprecedented fidelity, using actual research data as the foundation of our storytelling," says Wyatt.

A wide variety of programming will be offered inside the new dome, including traditional star shows, school group shows, immersive digital video productions, live video feeds, and musical events. Audience members will view shows that fill almost half their field of view and move at a rate of 30 images per second. This visually approximates an alternate reality, corresponding not to an experience under a dome, but an experience inside an environment.

"I am proud to play a role in the long and venerable history of Morrison Planetarium," says Wyatt. "The Morrison made history when it opened in 1952, showcasing the first American-made star projector—a home-grown invention that introduced new technologies to projector design and construction. When the new Morrison Planetarium opens next year, it will push the envelope once again, with both new technology and new content, and it will be an honor to help shepherd this beloved institution into the next phase of its life." Wyatt will work closely with the longtime voice of Morrison Planetarium, Bing Quock, who will serve as Assistant Director of Morrison Planetarium.

VOLUNTEER AT THE NEW ACADEMY



Matt Wandell, a regular volunteer, helps Steinhart Aquarium's biologists care for fish, alligators, and other animals.

Are you enthusiastic about the natural world? Do you want to work behind-the-scenes at the new Academy?

If so, consider becoming an Academy volunteer. Sign up for one of two upcoming opportunities, and play a vitally important role in launching the new facility next year:

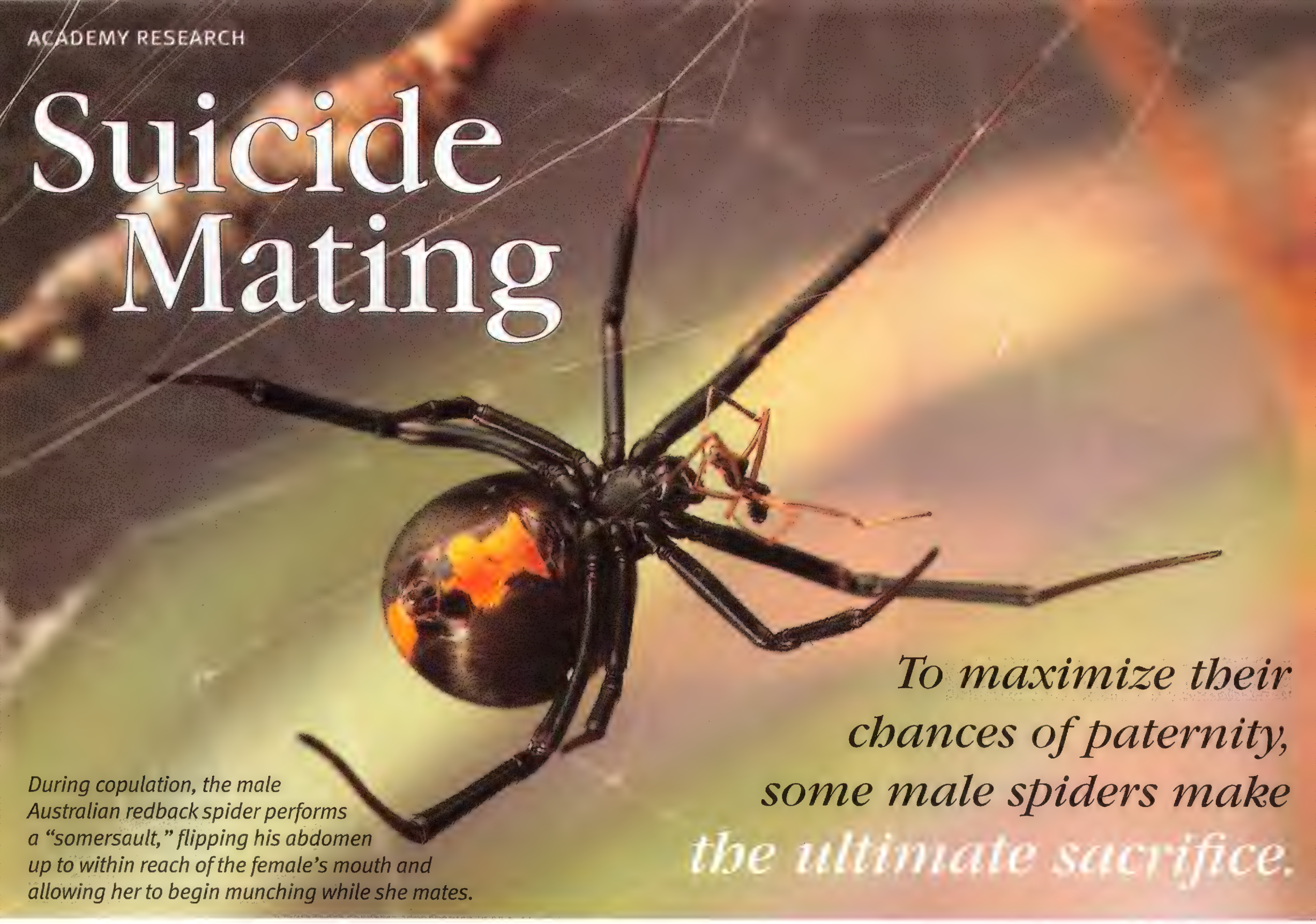
- **"Hidden Treasures" docent course –** Beginning in August 2007, docents will be trained to give tours about the Academy's eight research departments, the responsibilities of museum curators, and the global impact of Academy research. These tours will be among the first given in the new Academy.
- **Opportunities in the new Steinhart Aquarium –** Over 38,000 animals will make their home in the new facility. Become an aquarium volunteer and learn how to take care of live animals, test water quality, and check on animal health. If you're a certified SCUBA diver, you may get a chance to dive in exhibit tanks, perform maintenance, and give public programs where needed.

Sign up today!

For more information about volunteering, contact Rosalind Henning at 415.321.8111 or rhenning@calacademy.org.

Suicide Mating

To maximize their chances of paternity, some male spiders make the ultimate sacrifice.



During copulation, the male Australian redback spider performs a "somersault," flipping his abdomen up to within reach of the female's mouth and allowing her to begin munching while she mates.

Photo by: Ken Jones © M.C.B. Andrade, 2003

Necessity, as they say, is the mother of invention, and throughout the history of life on Earth, species survival has hinged on one need above all others—the need to reproduce. Countless creative mating strategies and surprising sexual practices have therefore evolved over time among animals. Although they are glued to the ground, some barnacles can inseminate neighbors up to seven shells away by extending long, snakelike genitalia. Many fish undergo spontaneous gender changes to adapt to their social environment and maximize their breeding opportunities. And hermaphroditic banana slugs, which have both male and female sexual organs, often get so entangled during copulation that they have to chew off each other's male genitalia to separate themselves. The prize for the most surprising strategy of all, however, may go to the male spiders who offer themselves up as a meal after mating by climbing inside the female's mouth. The female promptly devours the father of her future children—a practice known as sexual cannibalism.

> "Voluntary sexual cannibalism is the ultimate form of monogamy."
>
> -Jeremy Miller

While sexual cannibalism is not rare among insects and arachnids, voluntary participation on the part of the males is quite unusual. Scientists have recorded this bizarre behavior in about 20 species of spiders, many of which are not closely related to one another.

In fact, by mapping this behavioral trait onto a family tree, Academy entomologist Jeremy Miller has found that the sacrificial strategy has evolved at least six separate times. Although it seems counterintuitive, in certain circumstances natural selection clearly seems to favor males who are willing to sacrifice themselves after sex. "It's like an extreme form of monogamy" says Miller. In an attempt to tease out the reasons for this selective pressure, Miller developed three hypotheses about the self-sacrificial behavior.

The first hypothesis was that male spiders would not be willing to sacrifice themselves unless they were no longer capable of breeding. Miller predicted that male genital mutilation—damage sustained during copulation—would be a prerequisite for the evolution of male sacrifice. Genital mutilation has evolved a number of times among insects and arachnids as a paternity protection

Photo by: Ken Jones © M.C.B. Andrade, 2003

Left: When multiple males are found in a female's web, a male-biased sex ratio most likely exists. Each Australian redback female has an average of two males in her web during the mating season.

Right: An extreme example of sexual size dimorphism, male Australian redback spiders have 100 times less mass than the females.

Photo by: Ken Jones © M.C.B. Andrade, 2003

strategy. If a male's genitals break off inside the female during copulation and form a plug, he can often prevent or impede future males from fertilizing that female. As a consequence, he loses the ability to mate with additional females, but the chances that he will have offspring with the first female are improved.

Miller's second hypothesis was that male sacrifice would be more likely to develop when there were more males in a population than females, or—in scientific terms—when there was a male-biased sex ratio. Under these circumstances, it's hard enough for a male to mate just once. A male's chances of mating with a second female are very low indeed. As a result, males facing these odds put everything they have into their first mating. Females, which are relatively less abundant, may mate with as many males as they like.

Why would a population contain more males than females? That is the subject of Miller's third hypothesis. He postulated that an excessive number of males would be more likely to occur when females were substantially larger than males, a trait known as sexual size dimorphism. Large females can lay more eggs, so they are motivated to augment their waistlines. Males, however, gain no advantage from bulking up, so they tend to stay small, which enables them to reach sexual maturity more quickly. The presence of many males in the web of each female is evidence of a male-biased sex ratio.

To test these hypotheses, Miller tracked the presence or absence of male sacrifice, male genital mutilation, a male-biased sex ratio, and sexual size dimorphism in 157 different spider species. He found very high correlations for all three hypotheses. In all but one case, male genital mutilation was a prerequisite for male sacrifice. There was also a high correlation between male sacrifice and male-biased sex ratios. And sexual size dimorphism, with females much larger than the males, was always a prerequisite for male-biased sex ratios.

"Here's the basic story as I see it," Miller explains. "First, you get size dimorphism, which allows the females to lay more eggs. That leads to a male-biased sex ratio, which creates more competition for access to the females. Male genital mutilation often arises out of that competition as a way to prevent other males from successfully mating with your female. And since your chances of mating again with broken genitalia are low, the downside of sacrificing yourself might not be as bad as it seems."

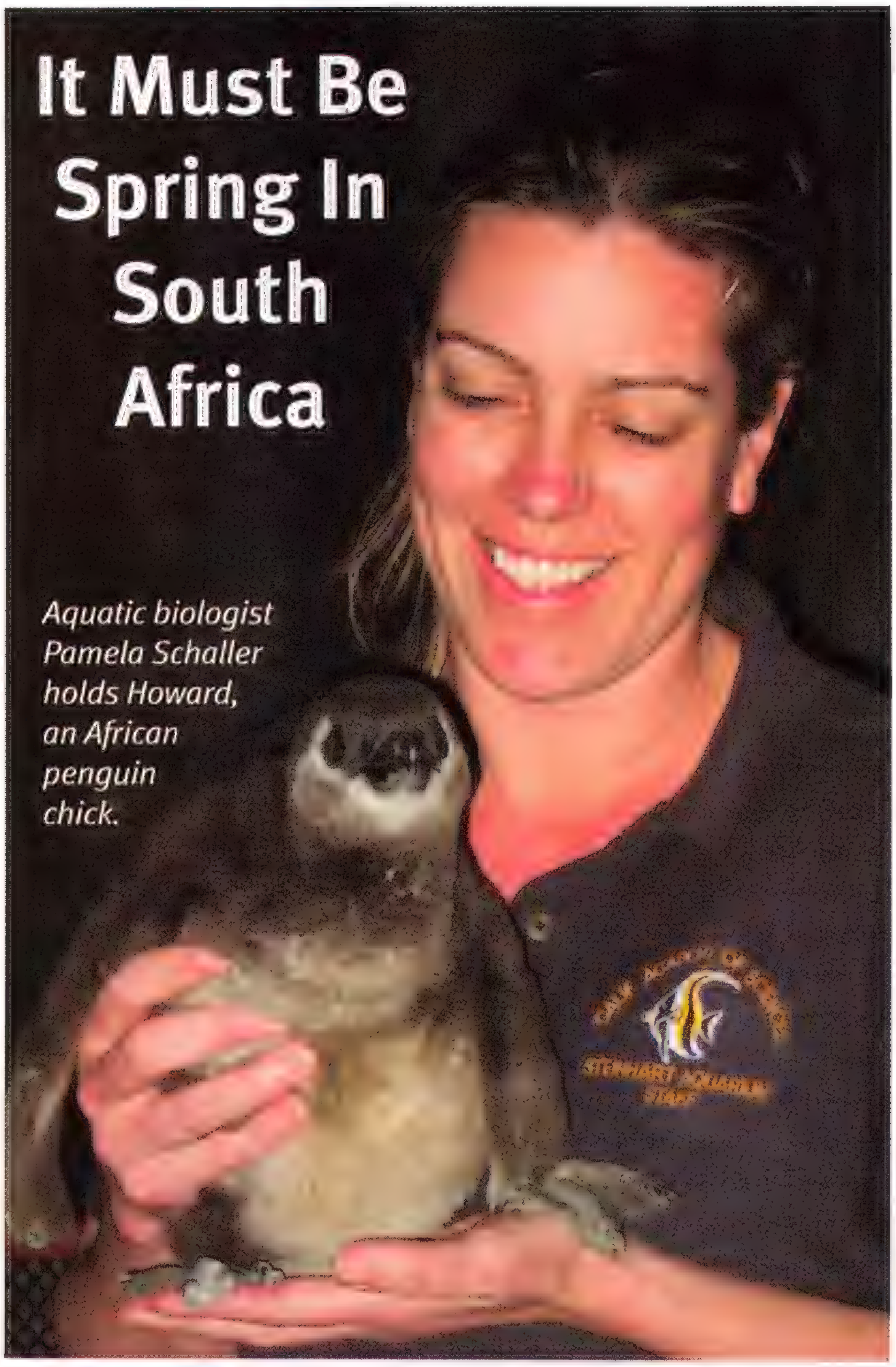
In fact, this system may have evolved among other groups of animals as well, including certain types of midges, ants, and bees. For these insects, competition is incredibly fierce for access to females—during swarm mating sessions, hundreds of males may compete for access to a single female. Mating is a fatal endeavor for the male members of these species, and male genital mutilation often takes place.

Is the sacrifice worth it? New research on the Australian redback spider (*Latrodectus hasselti*) suggests that it is. After conducting mating studies in a laboratory, scientists concluded that female redbacks are much less likely to accept a second mate if they eat their first mate than if they refrain from consuming their first suitor. Additionally, males who allow themselves to be eaten ultimately father more offspring than those who do not. For these spiders, sex is quite literally to-die-for.

Photo by: Jeremy Miller

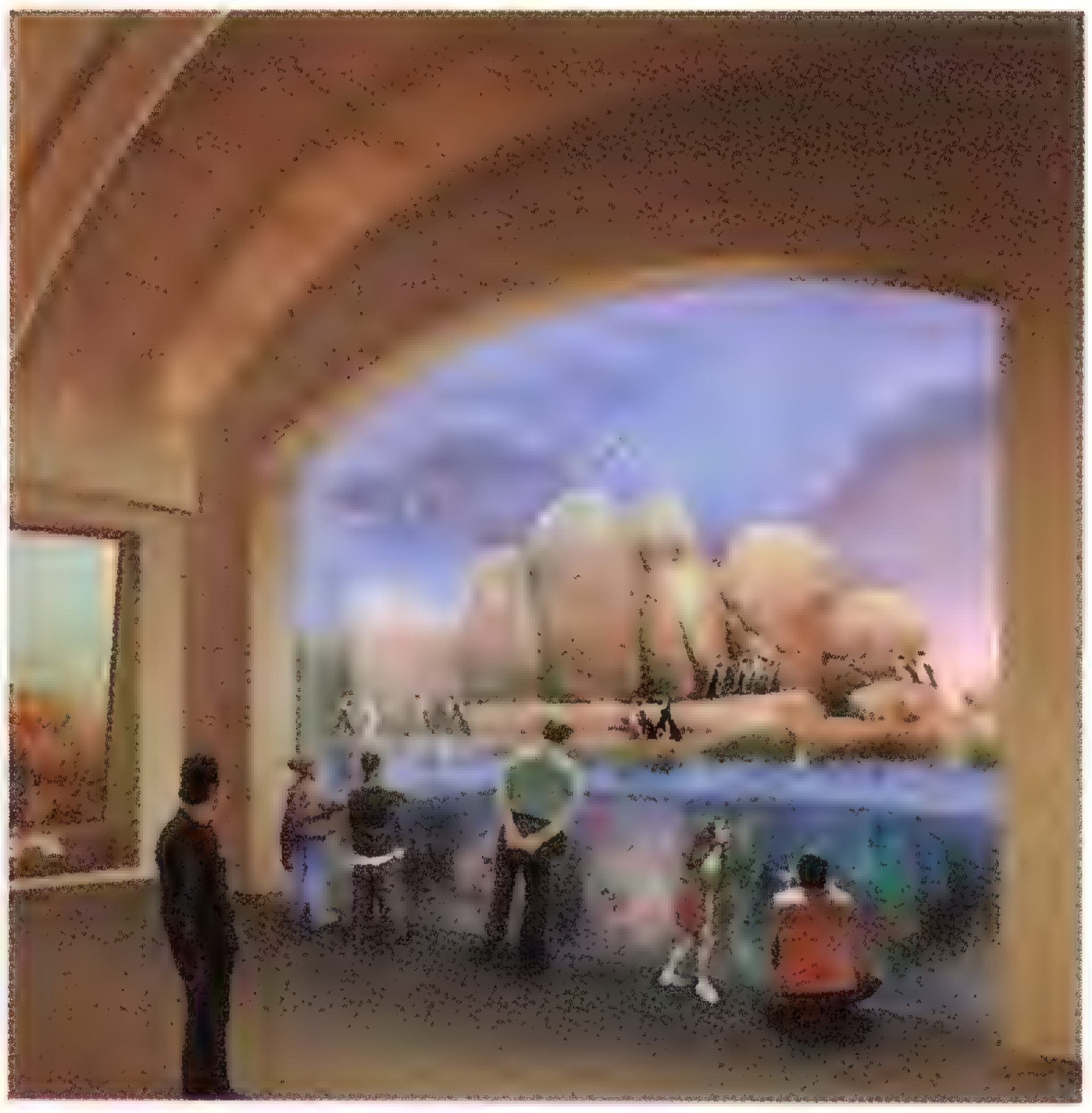
Black and yellow garden spiders (Argiope avantia) also engage in suicide mating. The males, which are much smaller than their mates, spontaneously die after copulating. The females then dine on their suitors.

It Must Be Spring In South Africa



Aquatic biologist Pamela Schaller holds Howard, an African penguin chick.

Howard, age 29 days.



The new Academy's penguin habitat will hold up to 18 African penguins. It may also house additional tankmates for the birds, although early trials have resulted only in frightened fishes and sea stars being used as nesting material.

Steinhart Aquarium's colony of African penguins has been keeping the staff busy in recent months. Tag and Agulhas, two of the aquarium's younger birds, became proud parents for the first time in January, when a healthy male chick hatched out of the egg they had been incubating. Named Howard in honor of the Academy's temporary home, he was the first chick born here in downtown San Francisco who will make the move back to Golden Gate Park next year. He won't, however, be the only new recruit. Two more new chicks were born at Howard Street in March, bringing the total number of birds in the Academy's colony to 11. The new African penguin habitat in Golden Gate Park is being built to house up to 18 birds.

In order to fill this new exhibit, Steinhart Aquarium biologists are hoping to raise more chicks in the months to come. To prevent inbreeding and encourage a diverse gene pool, they must carefully manage the breeding process for this threatened species. They do so by participating in the American Zoo and Aquarium Association's Species Survival Program (SSP), aimed at conserving this species in the wild. The SSP group determines which pairs of penguins should be allowed to breed in order to maximize genetic diversity. Tag, Agulhas, Jahleel, and Robben are all genetically valuable because of their diverse gene pool, so they will be encouraged to continue breeding over the next several months.

Few animals require more work than these charismatic birds. When the colony's primary caretaker wishes to take a few days off, the rest of the aquarium's biologists have to add up to 25 chores to their list of daily tasks. Feeding, egg handling, veterinary exams, water quality analysis, administering medications, changing air-handling filters, disinfecting the habitat, and recording behaviors while being pecked, bitten and slapped by birds that miss their keeper are normal duties. The Academy's biologists are now working with the aquarium's older birds to administer vitamins and check for diseases such as avian malaria (a mosquito-borne parasite), aspergillosis (a pulmonary fungus), and "bumblefoot" (a foot condition common among land-locked seabirds). At the same time, they are preparing formula, hand-feeding, weighing, naming, tagging and giving veterinary exams to the chicks.

Despite the long task list, the birds are undoubtedly worth the work. These black and white ambassadors have represented the aquarium well for over 20 years, both in the original Steinhart in Golden Gate Park and on Howard Street. Soon they will return to the park, where they will be on stage in a grand exhibit within the new Academy's African Hall.

ACADEMY TRAVEL PROGRAM

The mission of the Travel Program is to offer Academy-led tours that place members in the context of specifically chosen natural environments. Teaching, understanding, and conservation are our goals.

BELIZE BARRIER REEF: JEWEL OF THE CARIBBEAN

Aboard *Le Levant*

January 11 – 18, 2008

Leader: Dr. Robert Van Syoc

Just off the coast of Central America is a jewel of the Caribbean: the Belize Barrier Reef. On a special Academy adventure, swim and snorkel in one of the most spectacular coral reef ecosystems in the Western Hemisphere. See more than 70 types of coral and thousands of species of brilliantly colored fish, as well as sea turtles, rays, and schools of snappers and jacks. Stroll the white sand beaches of deserted tropical islands; snorkel in the Blue Hole, a perfectly round collapsed cave with spectacular coral reefs surrounding a circle of deep blue water; and view the thriving bird sanctuary on Half Moon Caye. You will cruise in luxury aboard the world-class expedition vessel, *Le Levant*, and experience 5-star accommodations, service, and cuisine.

Co-sponsors on this program are the Smithsonian Institution and Massachusetts Audubon Society.

Cost: from $4,990/person, based on double occupancy, plus airfare

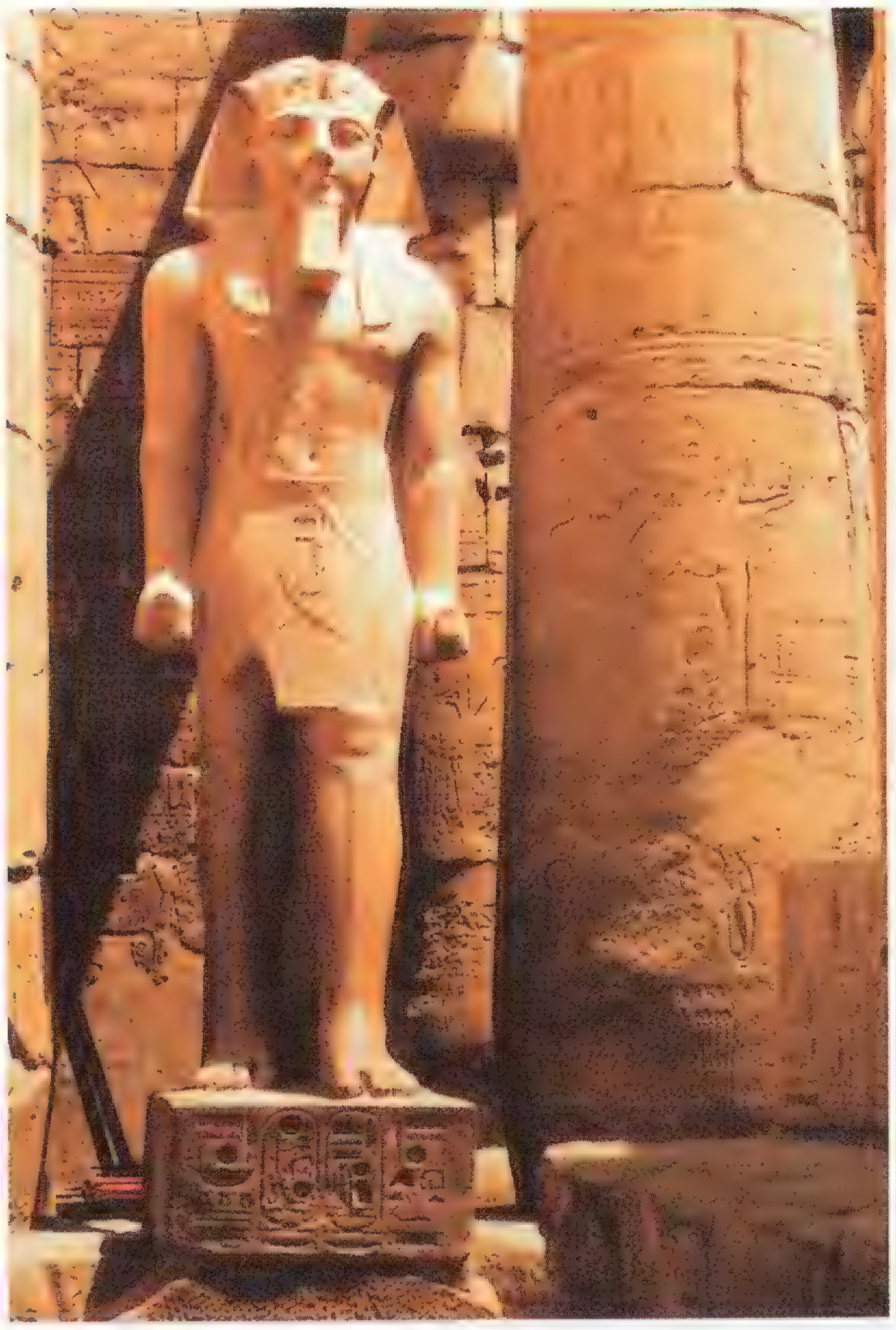
TREASURES OF THE PHARAOHS: EGYPT AND THE NILE

(with optional extension to Jordan)

Aboard *Sun Boat IV*

February 13 – 25, 2008

Leader: Dr. Jean DeMouthe



A journey along Egypt's Nile River takes travelers into the heart of a region with a cultural and architectural heritage spanning thousands of years – from the 4,700-year-old step pyramid of King Djoser to the soaring obelisks of Karnak.

Explore Cairo and the only remaining relic of the Seven Ancient Wonders – the Great Pyramids of Giza. Board the *Sun Boat IV* for a four-night cruise along the Nile River en route to the remarkable Valley of the Kings and the Temple of Abu Simbel. Other highlights include private access to a tomb normally closed to the public, time devoted to Islamic Cairo, the Egyptian Museum of Antiquities, and insight into the culture and history of the region from expert study leaders and Egyptologists.

Co-sponsors on this program are the American Museum of Natural History and Emory University.

Cost: from $6,890/person, based on double occupancy, plus airfare

For brochures or additional information, please contact the Academy Travel Office.
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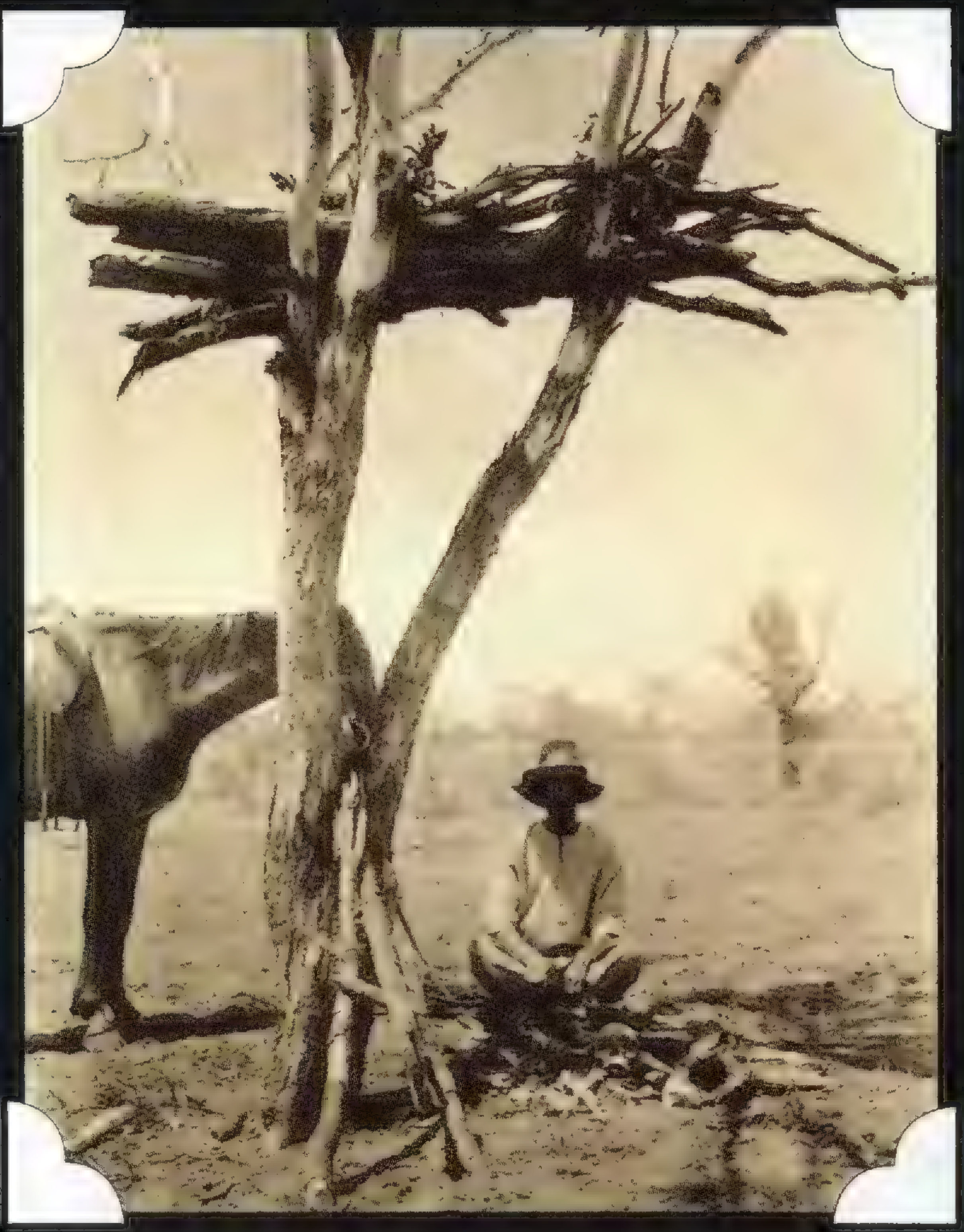
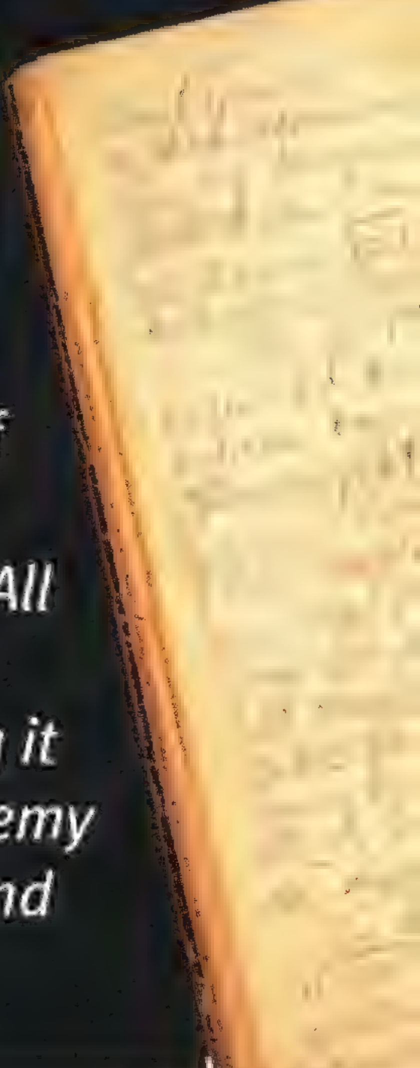
Disturbance *Down Under*

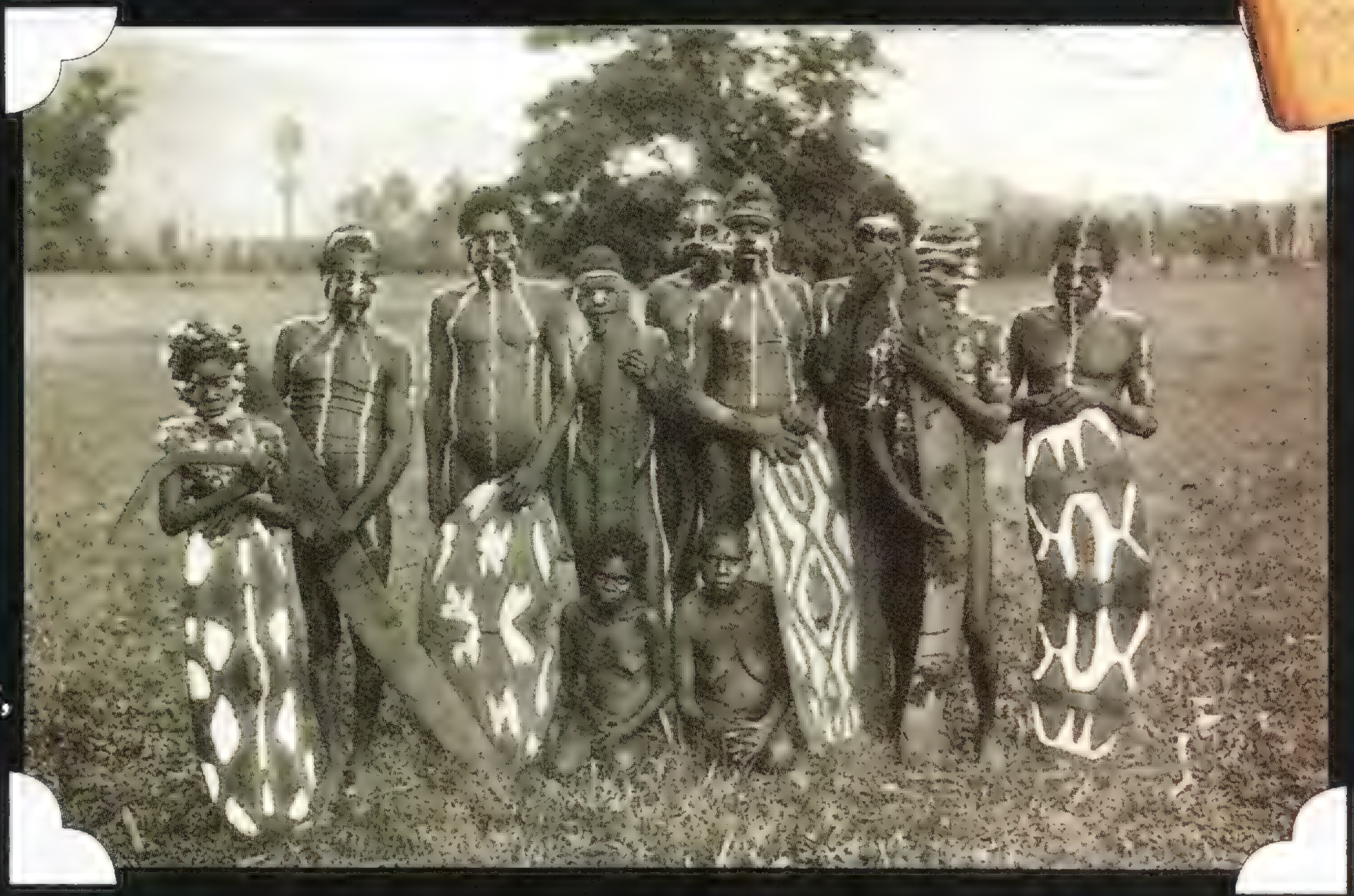


Left: Mjöberg's expedition wagon and oxen.



Right: A sample page from one of Mjöberg's expedition journals. All the writing is in Swedish, making it difficult for Academy staff to understand its contents.

Left: Some Aboriginal tribes placed their dead in tree platforms. On the ground is a disarticulated skeleton, probably removed from the tree.
Right: An Aboriginal tribe that Mjöberg encountered, displaying wooden shields, boomerangs, and cockatoo down on their bodies.



Twenty million animals, plants, minerals, and cultural artifacts—the Academy's research collections—have long attracted international attention, but few are aware of another Academy treasure. On the second floor of the Howard Street building, 210,000 books, 25,000 maps, 400 archive and manuscript collections, and over 300,000 images are neatly organized and catalogued. This is the Academy Library.

Karren Elsbernd has been on staff for 18 years. Navigating among the endless rows of archival material, amassed piecemeal for over a century, Karren is in her element. On a typical day, she might collate expedition pictures for exhibits in the new Academy, scan photos of the Foucault pendulum for an algebra textbook, or locate film reels of the Academy's old TV show "Science in Action."

"Archives are fascinating," she says, with visible pleasure. "I have researchers from around the world seeking us out for information and images."

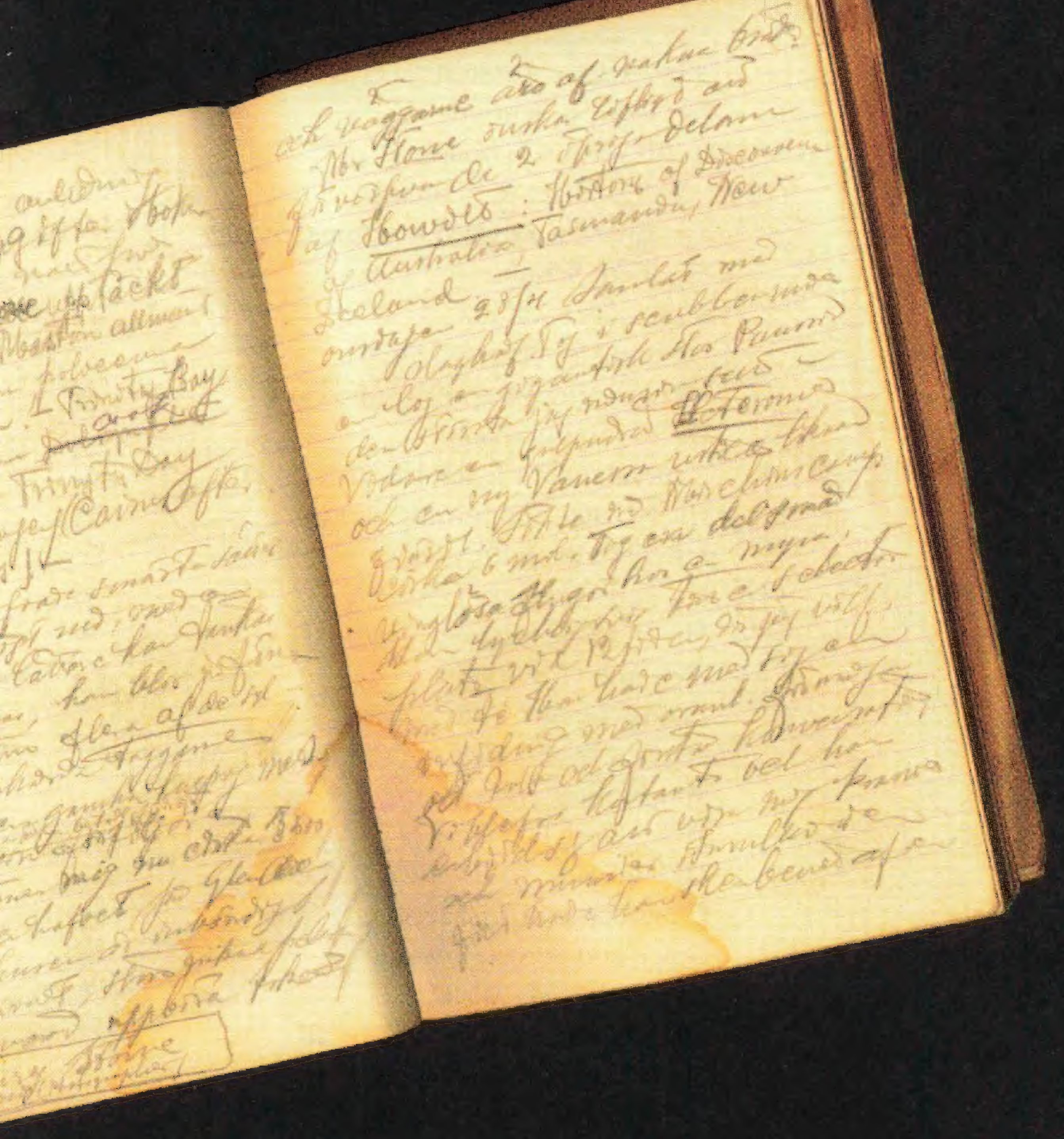
Oftentimes, these outside requests involve archival material that hasn't seen the light of day for decades, and whose origins are a total mystery to Karren.

A perfect example of this occurred in October 2004, when the Ministry for Foreign Affairs in Sweden inquired about a collection it had traced to the Academy via an online search. The collection belonged to Eric Mjöberg (pronounced "mYOE-ber"), a Swedish scientist who died in 1938. Karren and the Ministry soon discovered that the Academy holds the world's largest collection of Mjöberg's materials: journals, postcards, letters, manuscripts, newspaper clippings, books, and hundreds of photographs, covering the most fruitful years of the man's life and career.

Who was Eric Mjöberg? And how did his life's work end up at the Academy? Little did Karren know that this unfolding mystery would span three continents and involve episodes of grave-robbing, morphine addiction, mental breakdowns, and much more.

Karren Elsbernd of the Academy Library loves working with archives. "There is always some new mystery to discover," she says.

Academy Library helps solve 75-year-old mystery



An entomologist by training, Eric Mjöberg was only 28 years old when he was commissioned by the Swedish government to lead a scientific expedition to Australia. He and his team of biologists explored Northwestern Australia from 1910-11 and Queensland from 1912-13, surveying the native flora and fauna, collecting specimens, and learning about Aboriginal tribes. It was in this last area that he gained notoriety.

"The question as to how this people is genetically related to other races has long been a debated problem," Mjöberg wrote in a manuscript. According to historians, Mjöberg was obsessed with proving that the Aborigines were the missing link between prehistoric and modern humans. He collected over a dozen skeletons by trailing Aboriginal funeral processions, stealing the corpses, removing the flesh, then smuggling them out of Australia by telling officials that they were kangaroo bones.

"He was a very evil man," says Johan Gabrielsson, director of a documentary on Mjöberg's life. Gabrielsson learned about the Academy's collection through the Swedish Ministry, and he plans to use some of the photographs for his show. Called "Dark Science," it will air in Australia and Sweden later this year. "Mjöberg's expedition is a like a Gothic horror story, and it's all told in these journals."

After Australia, Mjöberg tried unsuccessfully to launch an aerial survey of New Guinea. Then from 1920-26, he worked in consulates and museums in Indonesia and eventually led an expedition to central Borneo. What happened after Indonesia, though, remains a mystery. He reportedly died in Stockholm in 1938—alone, locked in his apartment, addicted to morphine, and out of his mind.

Mjöberg had no connection with the Academy, so how did his personal collection end up in the Library? One clue appears in the 1932 Annual Report for the Department of Entomology: "By bequest from Mr. W. W. Funge we received 1,170 insects from the Mjöberg collection." Another clue is a handwritten note itemizing the collection, with a price of $60 at the bottom.

The likely scenario is that sometime between 1926 and 1932, Mjöberg abandoned or got separated from his luggage in San Francisco. (Gabrielsson believes that he was already mentally unstable at the time.) A Mr. W. W. Funge then purchased this luggage for $60 at an auction, and eventually donated it to the Academy because of the insect specimens.

Left: Some Aboriginal tribes mummified their dead by drying them in the sun or over a fire. Above: Mjöberg in the field, affecting an Aboriginal pose with a spear and shield.

And thus Mjöberg and his exploits were largely forgotten—until 2001, that is, when a researcher in the basement of the Swedish Museum of Ethnography stumbled across the stolen Aboriginal bones. Once their sordid history came to light, the Swedish Ministry decided to send them back to Australia. The handover ceremony occurred in September 2004 and was especially poignant for the Aborigines, who believe that spirits of the dead will not rest until their remains are buried in native soil. Mjöberg's grand-niece publicly apologized to the Aborigines for her grand-uncle's actions.

A month after the ceremony, the Ministry was delighted to find Mjöberg's lost journals at the Academy. They spent several days copying them for their official records. A story of deceit and sacrilege that began almost 100 years ago finally reached closure, thanks in part to the Academy Library.

"I know there are many stories in here," Karren says, gesturing to the thousands of other boxes of archival material. "Who knows what treasure we'll find next?"

THANK YOU

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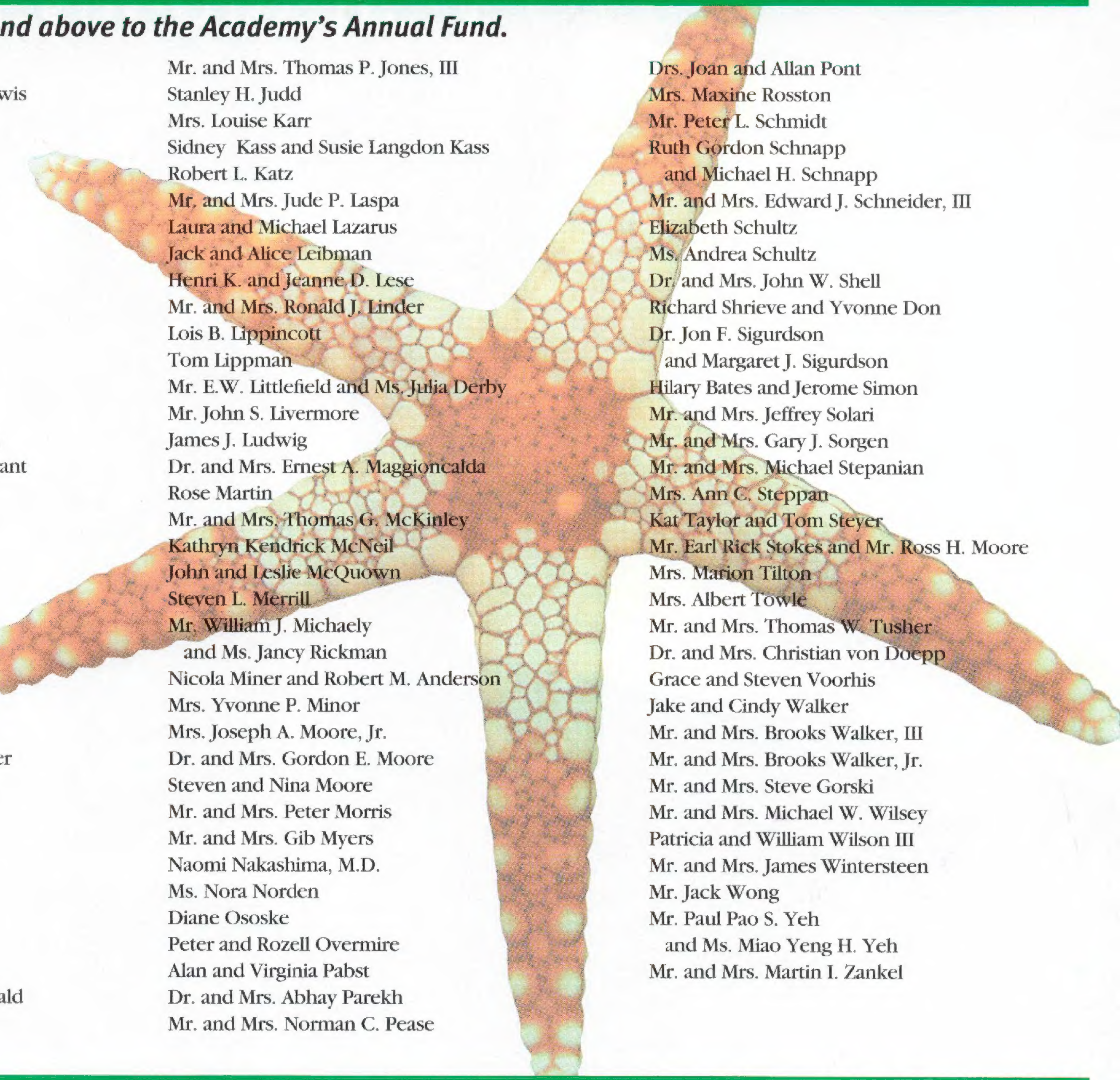

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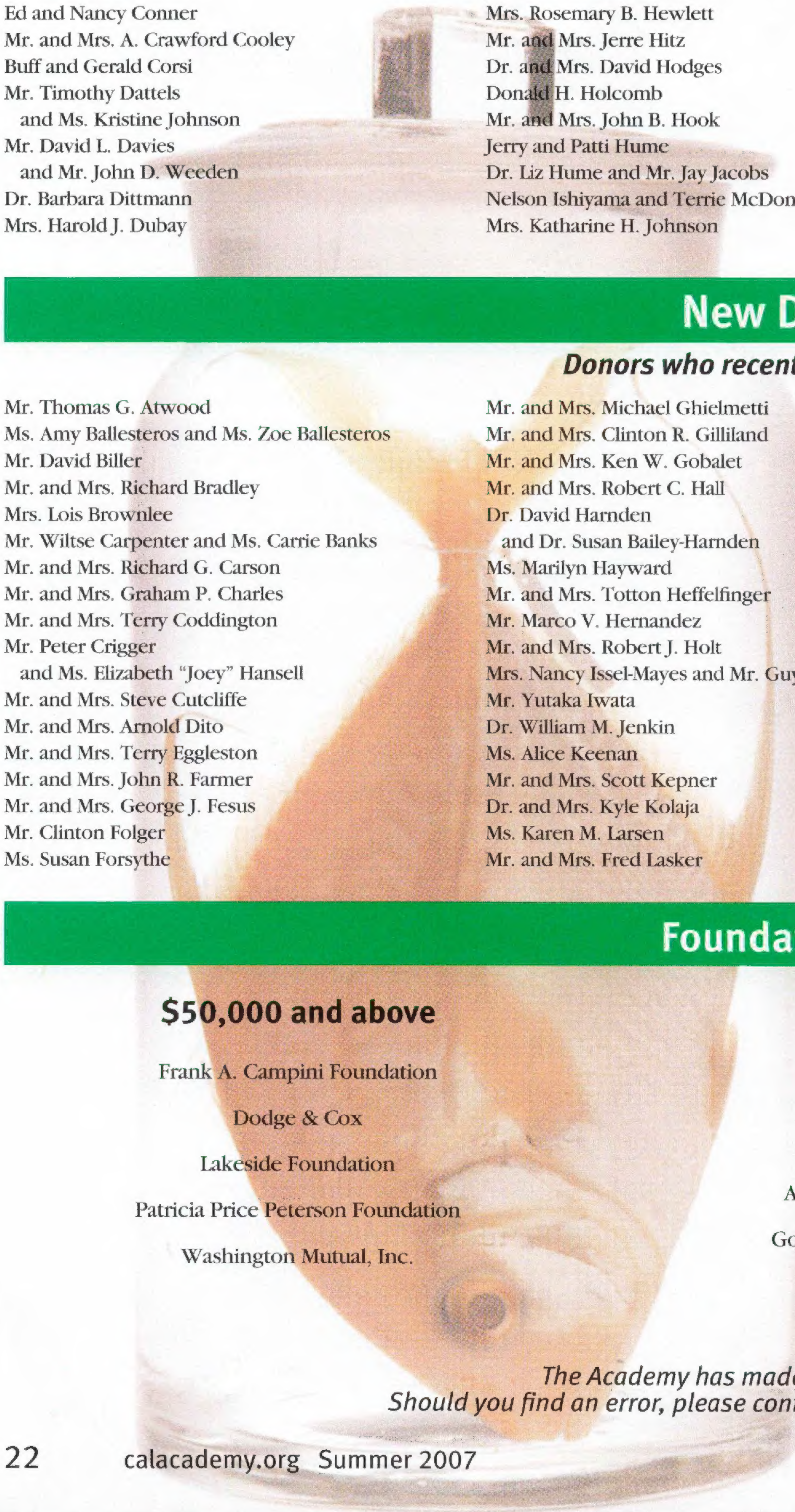

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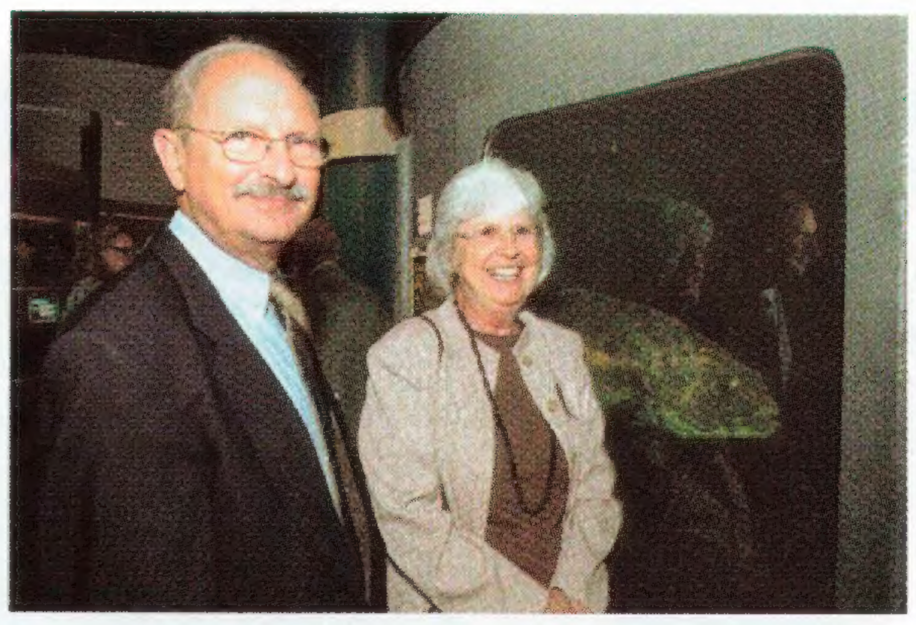
Should you find an error, please contact Natalie White at 415.321.8414 or nwhite@calacademy.org.

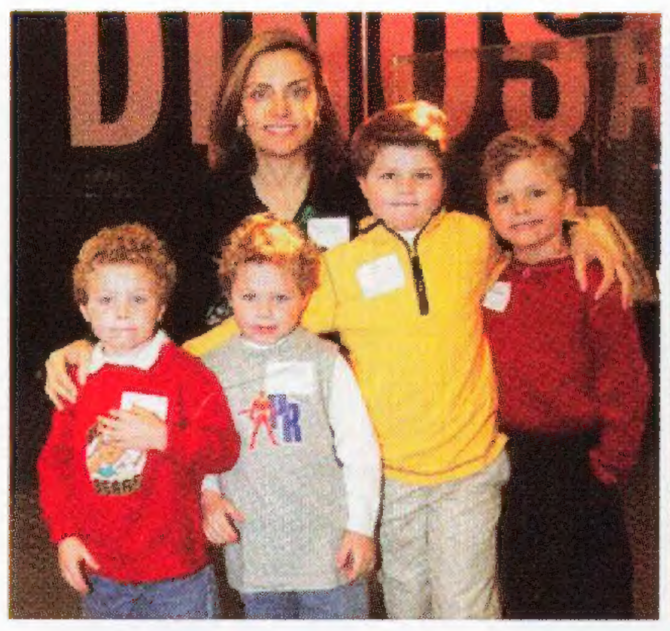
Friends of the Academy

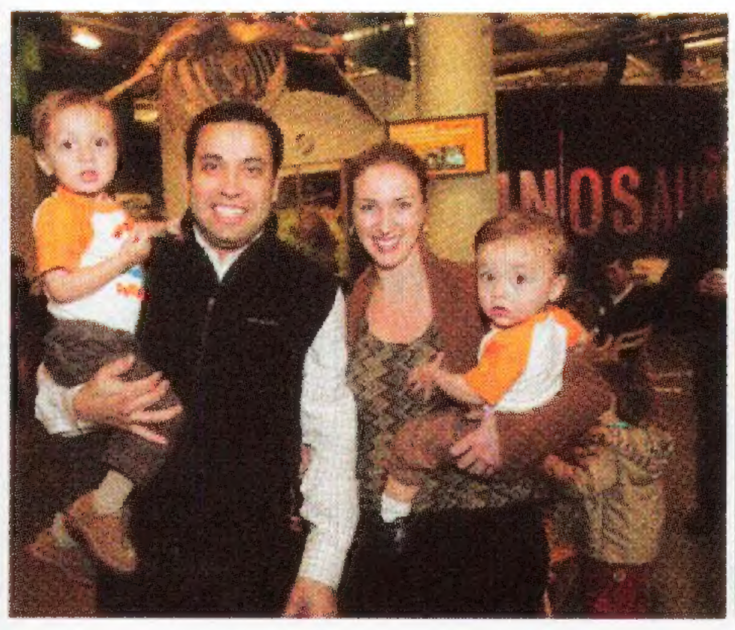
Friends of the Academy enjoy special benefits throughout the year, including invitations to exhibition previews and receptions, private behind-the-scenes tours, and other exclusive events. This summer, Friends are invited to private morning tours of Steinhart Aquarium, including an up-close look at the coral nursery.


Academy Friends Paul and Barbara Licht enjoy a tour of Steinhart Aquarium.

To learn more about Friends or to schedule a private tour, contact Jeanna Yoo at 415.321.8413 or jyoo@calacademy.org.

Academy Guild


Margaret, John, Mathew, Thomas, and Will Jacobsen.


Theo, Nick, Lucy, and Will Koukopoulos.

Marian and Eliza Heath.

Photo credit: Orange Photography

The Academy Guild enjoyed ***Breakfast with the Dinosaurs*** on Saturday, February 3. Guild families participated in dino-activities and feeding of live Academy critters, while taking a last look at *DINOSAURS: Ancient Fossils, New Discoveries* during special pre-public hours.

For more information about the Guild or to join, contact Jeanna Yoo at 415.321.8413 or jyoo@calacademy.org.

CHILDREN'S BIRTHDAY PARTIES

Celebrate your child's party at the Academy. The second floor classroom is available for children's birthday parties on Saturdays and Sundays.

Choose an Ocean theme party or create your own themed party that includes related take-home crafts and a guided tour. Children's birthday parties are open to members only. Book early as party spaces fill up fast.

For more information contact Centralized Reservations at 415.321.8000 or birthday@calacademy.org.

Spread the word – Free First Wednesdays!

The first Wednesday of every month is free at the Academy, ensuring that it can be enjoyed by individuals and families of all economic means. This year Free First Wednesdays has been made possible by the program's founder The Bernard Osher Foundation, The Kimball Foundation, and PG&E. Spread the word that free admission is offered to all on Free First Wednesdays!

ASTC TRAVEL PASSPORT

Traveling this summer? Take your Academy membership card with you and receive free or discounted admission to more than 270 science museums nationwide. For a complete list of participating museums in the ASTC Travel Passport program visit www.calacademy.org/membership or call 800.794.7576.

MEMBERS' eNEWS

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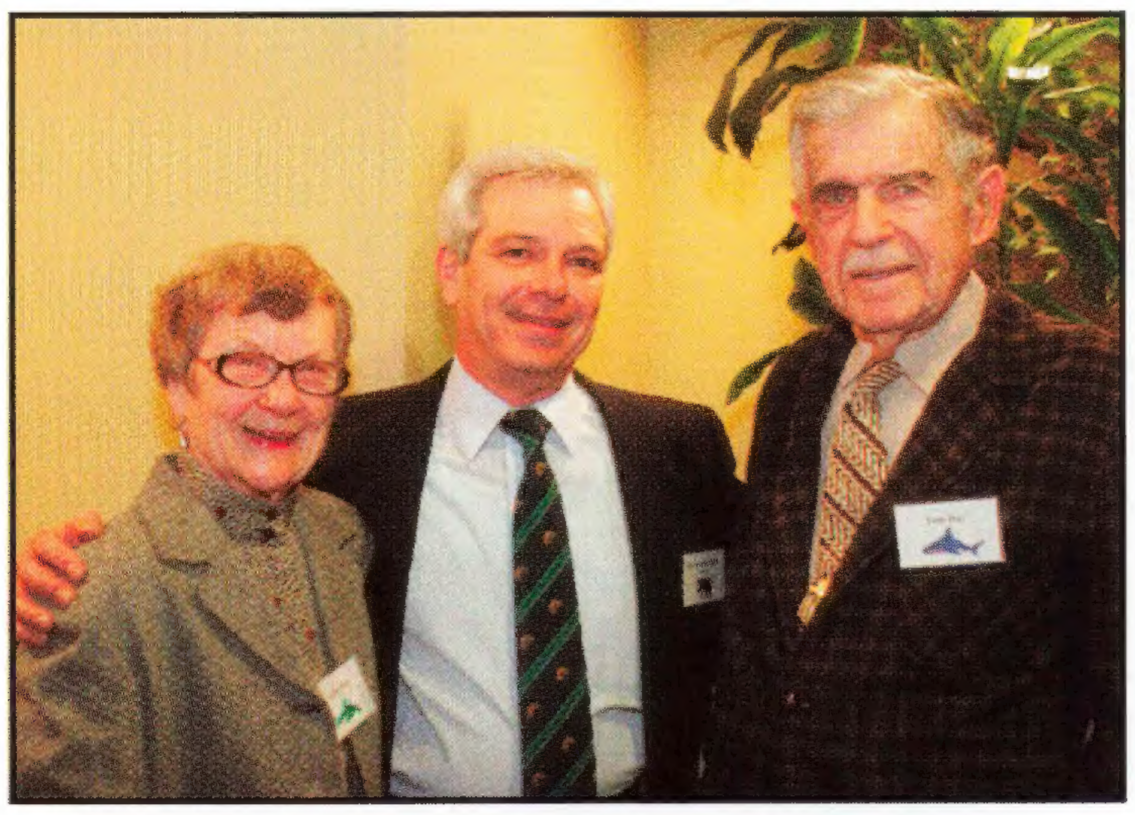
EASTWOOD TRADITION

For information about Eastwood Associates, contact Louise Gregory at 415.321.8407 or lgregory@calacademy.org.

Eastwood Associates, friends and volunteers who have included the Academy in their estate plans were honored at a special reception in late January and enjoyed a last look at *DINOSAURS: Ancient Fossils, New Discoveries.*


Arline and Tom Day with Academy botanist Frank Almeda

Sir William Fries II and Dona Crowder

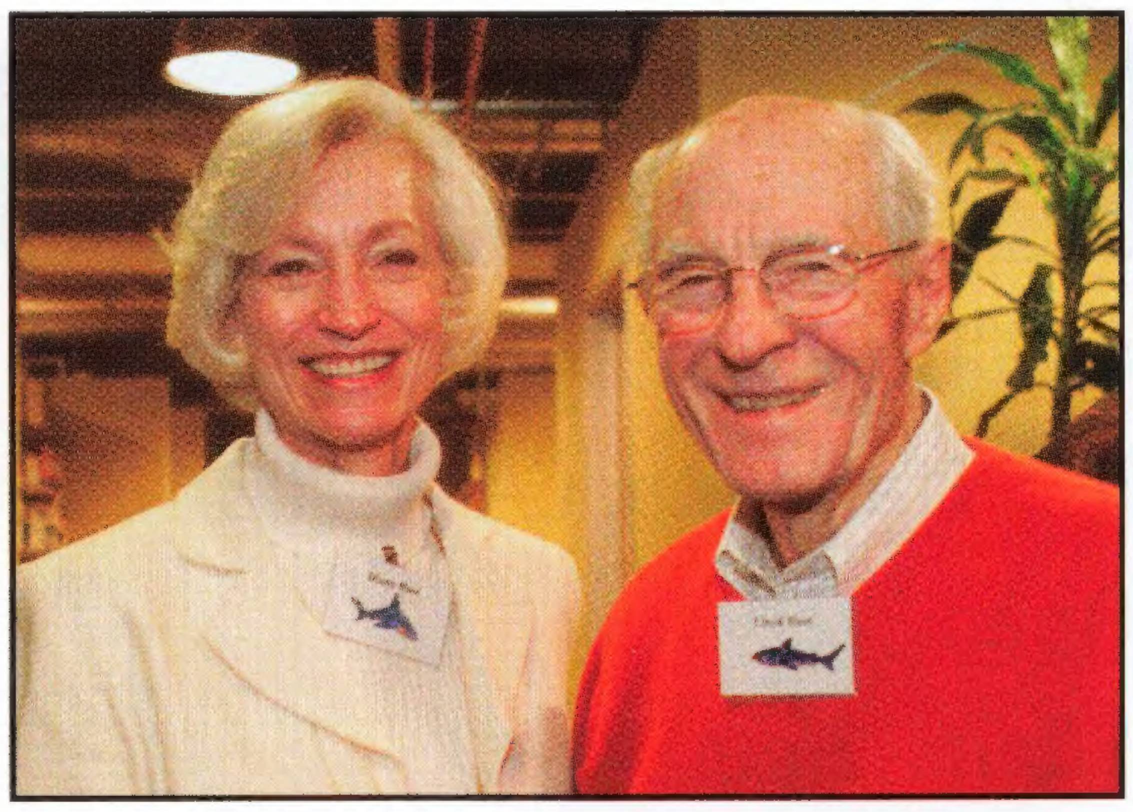

Diane and Lloyd Root

Photo credit: Orange Photography

NEW ACADEMY UPDATE

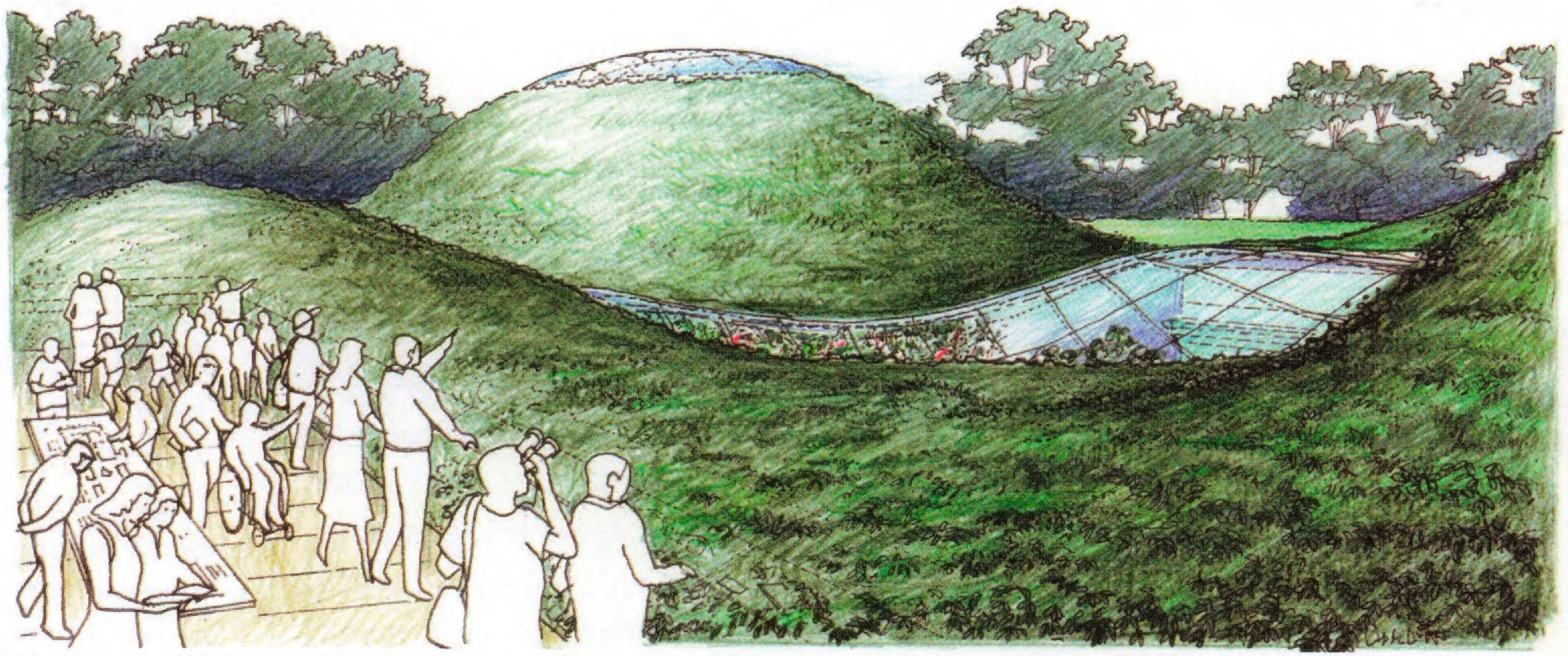
Over the past few months, a number of "green" building features have been integrated into the new Academy's iconic roof, including the greenest component of all—living plants. In May, specialists from Rana Creek Nursery began to install coconut-husk trays filled with native California plants onto the rolling hills of the roof. These trays, which are made from coconut farm waste products and are completely biodegradable, will disintegrate over time, leaving a seamless sea of strawberries, stonecrop, and other native species. This planted roof will provide excellent insulation, keeping interior temperatures about 10 degrees cooler than a standard roof and reducing low frequency noise by 40 decibels.

The roof, which is studded with 120 round skylights, will also be able to "breathe" on its own. Designed to open and close automatically to allow for natural ventilation and temperature control, these skylights will reduce the Academy's energy needs and allow natural sunlight to reach the living rainforest and coral reef exhibits.

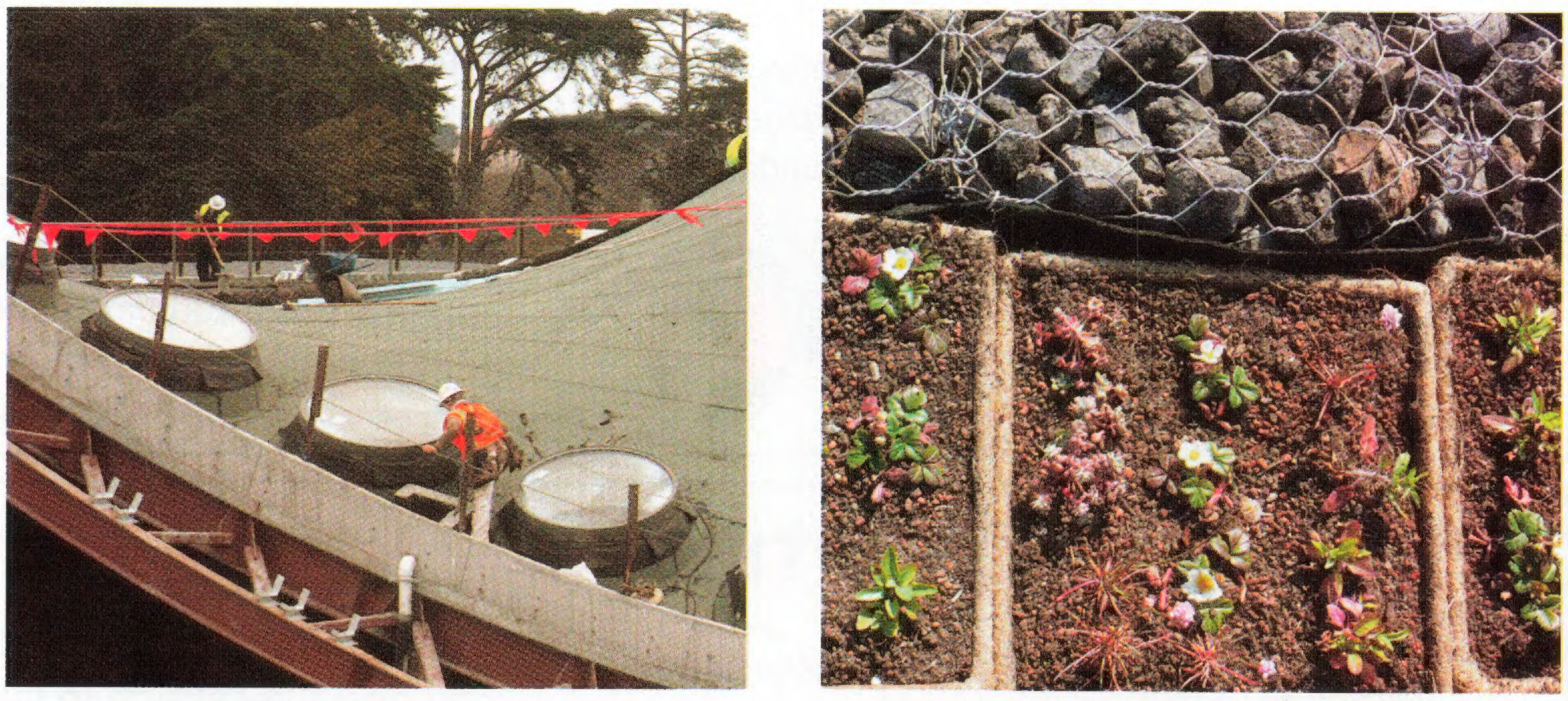
A canopy of solar panels has also been installed around the perimeter of the roof. The 60,000 photo voltaic cells in the canopy will supply almost 213,000 kWh of clean energy per year (about 5% of the new Academy's energy needs), and prevent the release of more than 405,000 pounds of greenhouse gas emissions.

"This is a building where the idea of sustainability is particularly strong," said project architect Renzo Piano during his last trip to the site in March. "We are making a science museum that is about nature and respect for nature, so it was almost a moral duty to be sustainable."

Architect Renzo Piano examines a test patch of plants on the roof.



Visitors will be able to view the living roof from an observation deck.



Left: These skylights allow sunlight to reach the coral reef. Right: Fifty thousand of these coconut husk trays will soon blanket the living roof.

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